MTNC040312A1
B01

Service Manual

Color Television

Simplified

CT-20SL14J / CT-20SL14TJ

GN3_(NA10)

This simplified service manual is issued to add listed models to the simplified service manual order No. MTNC030834A1 (CT-20SL13G). CT-20SL14J and CT-20SL14TJ are identical to CT-20SL13G except for the differences included on this simplified servicemanual. A complete parts list and schematics are included in this simplified service manual. Please file and use this simplified service manual together with the simplified service manual order No. MTNC030834A1 (CT-20SL13G) and the main service manualorder No. MTNC030623C1 (CT-25L8G).

⚠ **WARNING**

This service information is designed for experienced repair technicians only and is not designed for use by the general public.
It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product.
Products powered by electricity should be serviced or repaired only by experienced professional technicians. Any attempt to service or repair the product or products dealt with in this service information by anyone else could result in serious injury or death.

Panasonic®

IMPORTANT SAFETY NOTICE

There are special components used in this equipment which are important for safety. These parts are marked by ⚠ in the Schematic Diagrams, Circuit Board Diagrams, Exploded Views and Replacement Parts List. It is essential that these critical parts should be replaced with manufacturer's specified parts to prevent shock, fire or other hazards. Do not modify the original design without permission of manufacturer.

1. Safety precautions

General guidelines

An isolation transformer should always be used during the servicing of a receiver whose chassis is not isolated from AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injuryfrom electrical shocks. It will also protect the receiver from being damaged by accidental shorting that may occur during servicing.
When servicing, observe the original lead dress, especially in the high voltage circuit. Replace all damaged parts (also parts that show signs of overheating.)
Always replace protective devices, such as fish paper, isolation resistors and capacitors, and shields after servicing the receiver. Use only manufacturer's recommended rating for fuses, circuits breakers, etc.
High potentials are present when this receiver is operating. Operation of the receiver without the rear cover introduces danger for electrical shock. Servicing should not be performed by anyone who is not thoroughly familiar with the necessary precautionswhen servicing high voltage equipment.
Extreme care should be practiced when handling the picture tube. Rough handling may cause it to implode due to atmospheric pressure. (14.7 lbs per sq. in.). Do not nick or scratch the glass or subject it to any undue pressure. When handling, usesafety goggles and heavy gloves for protection. Discharge the picture tube by shorting the anode to chassis ground (not to the cabinet or to other mounting hardware). When discharging connect cold ground (i.e. dag ground lead) to the anode with a wellinsulated wire or use a grounding probe.Avoid prolonged exposure at close range to unshielded areas of the picture tube to prevent exposure to x-ray radiation.
The test picture tube used for servicing the chassis at the bench should incorporate safety glass and magnetic shielding. The safety glass provide shielding for the tube viewing area against x ray radiation as well as implosion. The magnetic shieldlimits the x ray radiation around the bell of the picture tube in addition to the restricting magnetic effects. When using a picture tube test jig for service, ensure that the jig is capable of handling 50kV without causing x ray radiation.
Before returning a serviced receiver to the owner, the service technician must thoroughly test the unit to ensure that is completely safe to operate. Do not use a line isolation transformer when testing.

Leakage current cold check

Unplug the A.C. cord and connect a jumper between the two plug prongs.Measure the resistance between the jumpered AC plug and expose metallic parts such as screwheads, antenna terminals, control shafts, etc. If the exposed metallic part has a returnpath to the chassis, the reading should be between 240k Ω and 5.2M Ω . If the exposed metallic part does not have a return path to the chassis, the reading should be infinite.

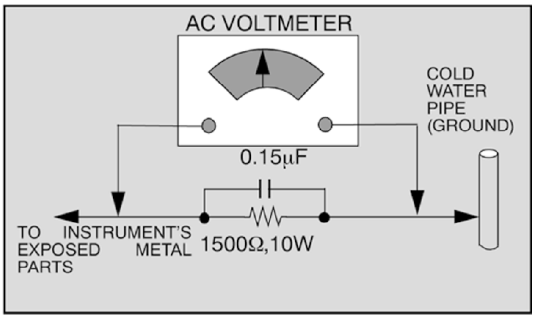
Leakage current hot check

Plug the AC cord directly into the AC outlet. Do not use an isolation transformer during the check. Connect a 1.5k Ω 10 watt resistor in parallel with a 0.15 μ F capacitor between an exposed metallic part and ground. Use earth ground, for example a water pipe.

Using a DVM with a 1000 ohms/volt sensitivity or higher, measure the AC potential across the resistor.

Repeat the procedure and measure the voltage present with all other exposed metallic parts. Verify that any potential does not exceed 0.75 volt RMS. A leakage current tester (such a Simpson model 229, Sencore model PR57 or equivalent) may be used in the above procedure, in which case any current measure must not exceed 0.5 milliamp. Ifany measurement is out of the specified limits, there is a possibility of a shock hazard and the receiver must be repaired and rechecked before it is returned to the customer.

Hot check circuit



Insulation test

Connect an insulation tester between an exposed metallic part and A.C. line. Apply 1080VAC/ 60Hz for 1 second. Confirm that the current measurement is 0.5mA ~ 2.0mA. Repeat test with other metallic exposed parts.

X ray radiation

WARNING

The potential source of x-ray radiation in the TV set is in the high voltage section and the picture tube.

NOTE

It is important to use an accurate, calibrated high voltage meter.

Set the brightness, picture, sharpness and color controls to minimum.
Measure the high voltage. The high voltage should be 29.25 ± 1.25kV for CT-20SL14J and 28.70 ± 1.25kV for CT-20SL14TJ. If the upper limit is out of tolerance, immediate service and correctionis required to insure safe operation and to prevent the possibility of premature component failure.

Horizontal oscillator disable circuit test

This test must be performed as a final check before the receiver is returned to the customer. See horizontal oscillator disable circuit procedure check in this manual.

2. Service notes

NOTE
These components are affixed with glue. Be careful not to break or damage any foil under the component or at the pins of the ICs when removing. Usually applying heat to the component for a short time while twisting with tweezers will break the component loose.

Leadless chip component (surface mount)

Chip components must be replaced with identical chips due to critical foil track spacing. There are no holes in the board to mount standard transistors or diodes. Some chips capacitor or resistor board solder pads may have holes through the board,however the hole diameter limits standard resistor replacement to 1/8 watt. Standard capacitor may also be limited for the same reason. It is recommended that identical components be used.
Chip resistor have a three digit numerical resistance code, 1st and 2nd significant digits and a multiplier. Example: 162 = 1600 or 1.6k Ω resistor, 0 = 0 Ω (jumper).
Chip capacitors generally do not have the value indicated on the capacitor. The color of the component indicates the general range of the capacitance.
Chip transistors are identified by a two letter code. The first letter indicates the type and the second letter, the grade of transistor.
Chip diodes have a two letter identification code as per the code chart and are a dual diode pack with either common anode or common cathode. Check the parts list for correct diode number.

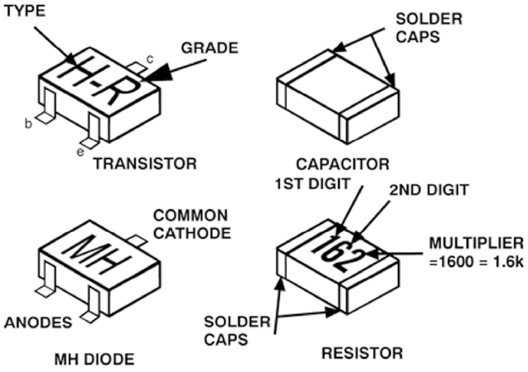
Component removal

1. **Use solder wick to remove solder from component end caps or terminal.**
2. **Without pulling up, carefully twist the component with tweezers to break the adhesive.**
3. **Do not reuse removed leadless or chip components since they are subject to stress fracture during removal.**

Chip component installation

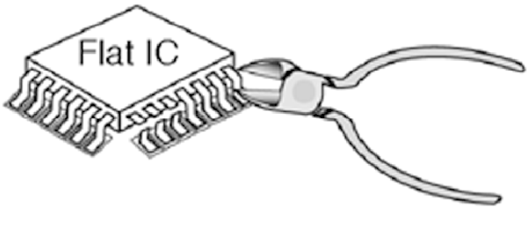
1. Put a small amount of solder on the board soldering pads.
2. Hold the chip component against the soldering pads with tweezers or with a miniature alligator clip and apply heat to the pad area with a 30 watt iron until solder flows. Do not apply heat for more than 3 seconds.

Chip components

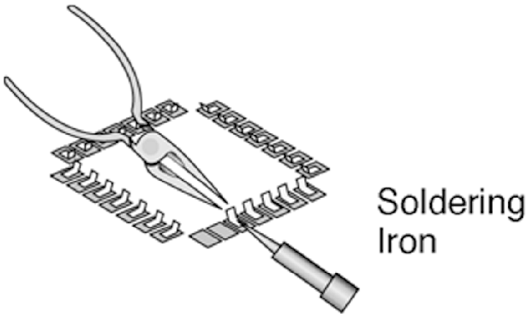

TYPE
GRADE
H-R
c
b
e
TRANSISTOR
SOLDER CAPS
CAPACITOR
1ST DIGIT
2ND DIGIT
COMMON CATHODE
MH
ANODES
MH DIODE
162
MULTIPLIER =1600 = 1.6k
SOLDER CAPS
RESISTOR

How to replace flat IC (required tools)

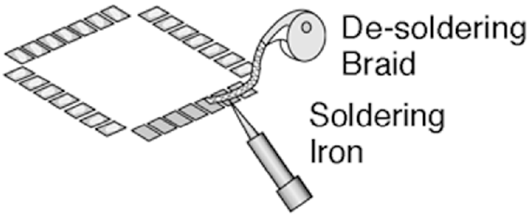
1. Remove the solder from all of the pins of a Flat IC by using a desolder braid



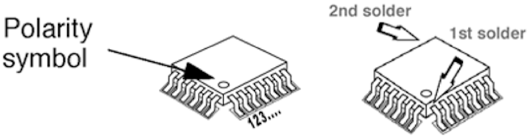
2. Put the iron wire under the pins of the Flat IC and pull it in the direction indicated while heating the pins using a soldering iron. A small awl can be used instead of the iron wire.


Soldering
Iron

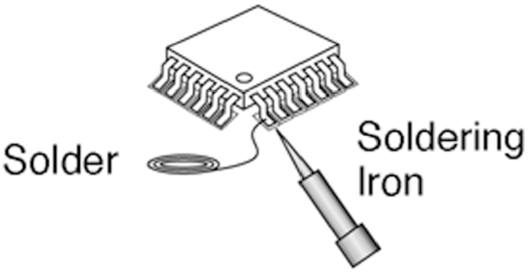
3. **Remove the solder from all the pads of the Flat IC by using a de solder braid**


De-soldering
Braid
Soldering
Iron

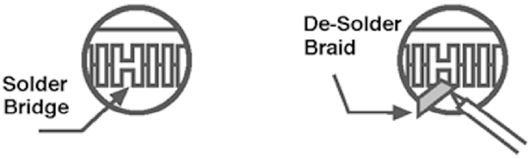
4. **Position the new Flat IC in place (apply the pins of the Flat IC to the soldering pads where the pins need to be soldered). Properly determine the positions of the soldering pads and pins by correctly aligning the polarity symbol**


Polarity
symbol
123....
2nd solder
1st solder

5. **Solder all pins to the soldering pads using a fine tipped soldering iron**


Solder
Soldering
Iron

6. **Check with a magnifier for solder bridge between the pins or for dry joint between pins and soldering pads. To remove a solder bridge, use a de solder braid as shown in the figure below**


Solder
Bridge
De-Solder
Braid

IMPORTANT

To protect against possible damage to the solid state devices due to arching or static discharge, make certain that all ground wires and CRT DAG wire are securely connected.

CAUTION

The power supply circuit is above earth ground and the chassis cannot be polarized. Use an isolation transformer when servicing the receiver to avoid damage to the test equipment or to the chassis. Connect the test equipment to the proper ground(hot) or (cold) when servicing, or incorrect voltages will be measured.

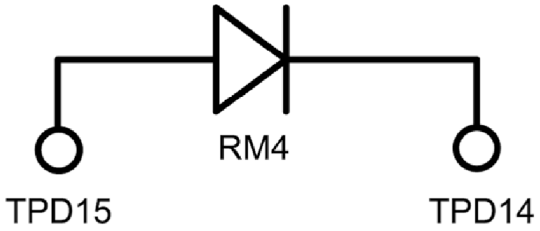
2.1. X-Ray Protection Circuit Check & Adjustments

This test must be performed as final check before the receiver is returned to the customer. If voltages are out of tolerance, immediate service and correction is required to insure safe operation and to prevent the possibility of premature componentfailure.

Equipment:

1. **Isolation transformer.**
2. **High voltage meter.**
3. **D.C. Ammeter**
4. **Short jumper.**
5. **HHS jig (See figure below).**

Diode Connection Jumper.



Preparation:

1. **Make sure the receiver is turned off.**
2. **Connect the receiver to an isolation transformer.**
3. **Connect the ammeter serial from the flyback anode lead to the picture tube anode socket.**

4. Prepare short jumper and HHS jig.

Procedure:

1. Connect the short jumper between TPD16 & TPD17.
2. Connect the jumper diode between TPD14 and TPD15 (anode connected to TPD15 and cathode to TPD14).
3. Apply 75VAC to AC input of isolation transformer.
4. Turn the receiver on.
5. Apply a monoscope pattern.
6. Set customer picture and brightness controls to the minimum.
7. Set current within 50 μ A to 100 μ A by changing the picture and bright controls.
8. Slowly increase AC voltage at the input of the isolation transformer and confirm HHS voltage measure 30.0kV.
9. Turn power off and remove jigs.

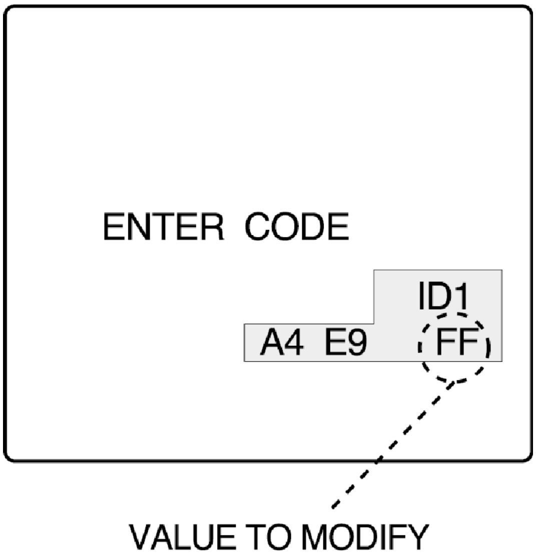
3. EEPROM replacement

If a new EEPROM integrated circuit is replaced for servicing, follow the next procedure once that the memory is properly assembled:

1. Enter to service mode.
2. Turn the TV set ON.
3. Once inside service mode the first image that appears on-screen is the ID1 register with the respective address value (FF) like the image below.

   Note:

   All 3 registers (ID1,ID2,ID3) should appear with FF values if a new EEPROM is assembled.



4. With “VOL” keys adjust the correct value according with the service adjustment table (see “Service Mode” section).
5. Change to the next ID switch register with “CH” keys and repeat the same procedure as step 4.
6. When replacing a new EEPROM be sure to set the correct ID switch values for each model.
7. Once that all 3 registers are set with the correct address value, perform all of the remaining adjustments and servicing.

IMPORTANT:

Correct ID switch configuration should be input when replacing EEPROM for each television model, otherwise if wrong values are configured, the television software will not function accordingly and properly.

4. About lead free solder (PbF)

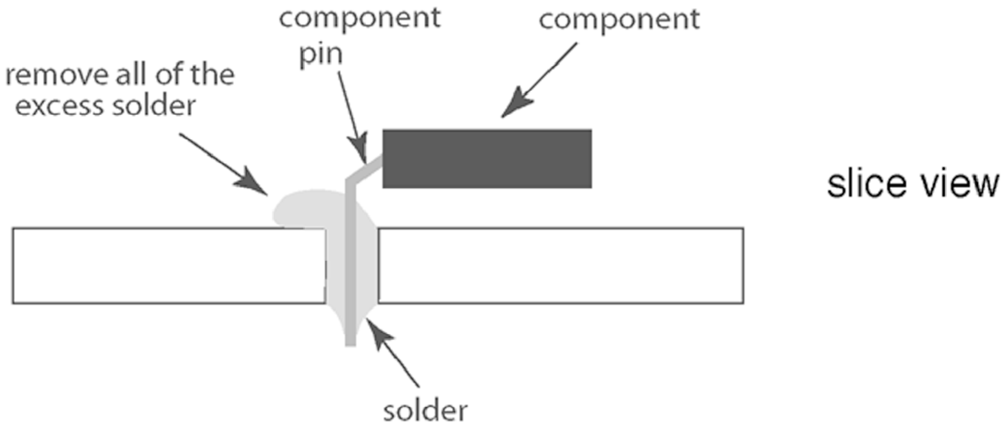
NOTE

Lead is listed as (Pb) in the periodic table of elements. / In the information below, Pb will refer to lead solder, and PbF will refer to Lead Free Solder. / The lead free solder used in our manufacturing process and discussed below is (Sn+Ag+Cu). / Thatis Tin (Sn), Silver (Ag) and Copper (Cu) although other types are available.

This model uses Pb Free solder in it’s manufacture due to environmental conservation issues. For / service and repair work, we’d suggest the use of Pb free solder as well, although Pb solder may be / used. / PCBs manufacturedusing lead free solder will have the “PbF” or a leaf symbol stamped on the / back of PCB.

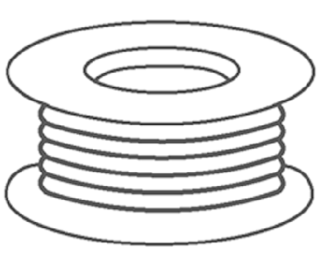
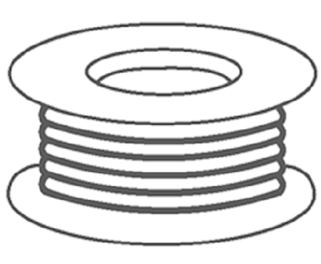
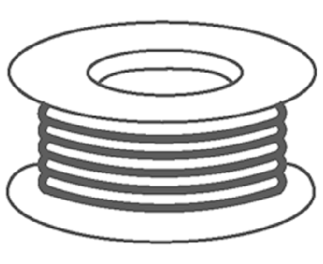
CAUTION

- **Pb free solder has a higher melting point than standard solder. Typically the melting point is 50 ~ 70 °F (30 ~ 40 °C) higher. Please use a high temperature soldering iron and set it to 700 ± 20 °F (370 ± 10 °C).**
- **Pb free solder will tend to splash when heated too high (about 1100 °F or 600 °C). / If you must use Pb solder, please completely remove all of the Pb free solder on the pins or solder area before applying Pb solder. If thisis not practical, be sure to heat the Pb free solder until it melts, before applying Pb solder.**
- **After applying PbF solder to double layered boards, please check the component side for excess solder which may flow onto the opposite side.**



Suggested Pb free solder

There are several kinds of Pb free solder available for purchase. This product uses Sn+Ag+Cu (tin, silver, copper) solder. However, Sn+Cu (tin, copper), Sn+Zn+Bi (tin, zinc, bismuth) solder can also beused.

0.3mm X 100g	0.6mm X 100g	1.0mm X 100g
		

5. Receiver feature table

FEATURE/MODEL	CT-20SL14J	CT-20SL14TJ
CHASSIS	AP432	DP414
MICRO	128K	
MENU LANGUAGE	ENG/SPAN/FR	
CLOSED CAPTION	X	
V-CHIP (USA/CANADA)	X	
CHANNEL COUNT	181	
CHANNEL INFO BANNER	X	
VIDEO INPUT SKIP	SKIP	
75 OHM INPUT	X	
REMOTE CONTROL	EUR7613ZB0 EUR7613Z6A	
CRT SUPPLIER	SAMSUNG SEMI TINT	SAMSUNG TINT
FAMILY	GN3	
COMB FILTER	MOTION ADP. 3 DIG	
HEC/VEC (X=BOTH)	X	
V/A NORM (X=BOTH)	X	
COLOR TEMP	X	
PRESET/INPUT LABELING	X	
MTS/SAP/DBX	X	
BUILT-IN AUDIO POWER	5Wx2	
No. OF SPEAKERS	2	
BASS/BAL/TREBLE CONTROL	X	
AI SOUND	X	
SURROUND	X	
A/V IN (REAR/FRONT)	3(2/1)	
AUDIO OUT (FAO: F, VAO: V)	F, V	
COMPONENT INPUT (Y, Pb, Pr)	1	
S-VIDEO INPUT (REAR/FRONT)	1/0	
EPJ/HPJ/MISC	HPJ	
DIMENSIONS(WxDxH)	708x588x591mm27.87x23.15x23.27in	
WEIGHT (Kg/Lbs)	24.5/54.01	

Note:

Specifications are subject to change without notice or obligation. Dimensions and weights are approximate.

6. Board description table

CT-20SL14J

BOARD	PART NUMBER	DESCRIPTION
A	TNP2AH060CD	MAIN BOARD
C	TNP2AA167CB	CRT BOARD

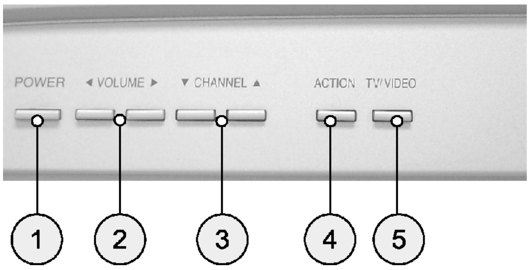
CT-20SL14TJ

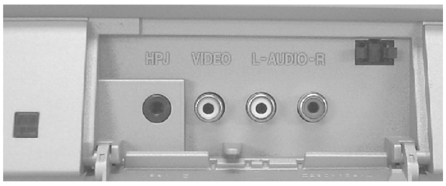
BOARD	PART NUMBER	DESCRIPTION
A	TNP2AH060CG	MAIN BOARD
C	TNP2AA167CC	CRT BOARD

NOTE
When ordering a replacement board assembly, append an “S” to the board number

EXAMPLE
To order the A Board for CT-20SL14J, order as TNP2AH060CDS.

7. TV Location of controls



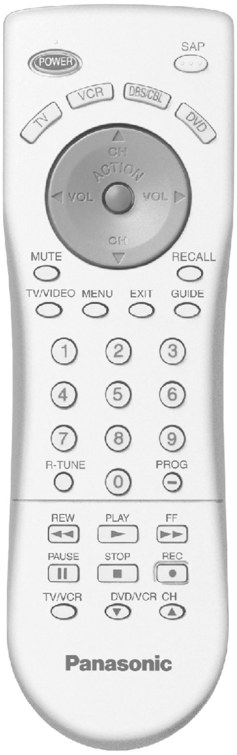


IR Sensor
& Front A/V jacks

Quick reference control operation	
①	**Power** - Press to turn ON or OFF.
②	**Volume** - Press to adjust sound level, or to adjust audio menus, video menus, and select operating features when menus are displayed
③	**Channel** - Press to select programmed channels. Press to highlight desired features when menus are displayed. Also use to select cable converter box channels after programming remote control infra-red codes (the TV/AUX/CABLE switch must be set in CABLE position).
④	**Action** - Press to display main menu and access on screen feature and adjustment menus.
⑤	**TV/Video** - Press to select TV or one of the video inputs.

8. Location of controls (remote)

8.1. EUR7613ZB0


POWER
SAP
TV
VCR
DBS/CBL
DVD
CH
ACTION
VOL
VOL
CH
MUTE
RECALL
TV/VIDEO
MENU
EXIT
GUIDE
1
2
3
4
5
6
7
8
9
R-TUNE
0
PROG
REW
PLAY
FF
PAUSE
STOP
REC
TV/VCR
DVD/VCR CH
Panasonic

POWER
Press to turn ON and OFF.

TV - VCR - DBS/CBL - DVD
Press to select a component.

MUTE
Press to mute sound.

TV/VIDEO
Press to select TV, Video mode.

MENU
Press to select TV, Video mode.

KEYBOARD
Press to select any channel.

R-TUNE
Press to switch to previously viewed channel or video mode.

SAP
Press to acces the secondary audio program broadcast.

CH
Press to select next or previous channel and navigate in menus.

VOL
Press to adjust TV sound and navigate in menus.

RECALL
Press to display time, channel sleep timer and other options.

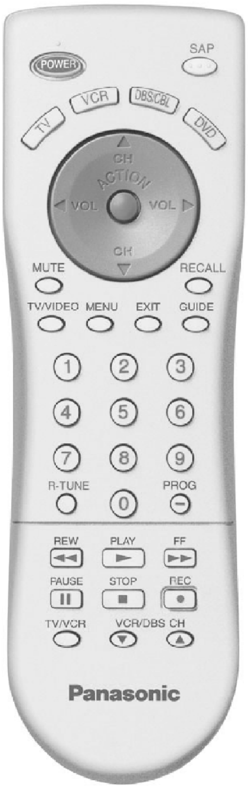
GUIDE
DBS and DVD functions button.

EXIT
DBS menu function button.

PROG
Press for delimiter between major and minor channel number.

Note:
For additional information about this remote please refer to the owner's manual section remote operation, listed on the parts list section.

8.2. EUR7613Z6A


POWER
SAP
TV
VCR
DBS/CBL
DVD
CH
ACTION
VOL
VOL
CH
MUTE
RECALL
TV/VIDEO
MENU
EXIT
GUIDE
1
2
3
4
5
6
7
8
9
R-TUNE
0
PROG
REW
PLAY
FF
PAUSE
STOP
REC
TV/VCR
VCR/DBS CH
Panasonic

POWER
Press to turn ON and OFF.

TV - VCR - DBS/CBL - DVD
Press to select a component.

MUTE
Press to mute sound.

TV/VIDEO
Press to select TV, Video mode.

MENU
Press to select TV, Video mode.

KEYBOARD
Press to select any channel.

R-TUNE
Press to switch to previously viewed channel or video mode.

SAP
Press to acces the secondary audio program broadcast.

CH
Press to select next or previous channel and navigate in menus.

VOL
Press to adjust TV sound and navigate in menus.

RECALL
Press to display time, channel sleep timer and other options.

GUIDE
DBS and DVD functions button.

EXIT
DBS menu function button.

PROG
Press for delimiter between major and minor channel number.

Note:
For additional information about this remote please refer to the owner's manual section remote operation, listed on the parts list section.

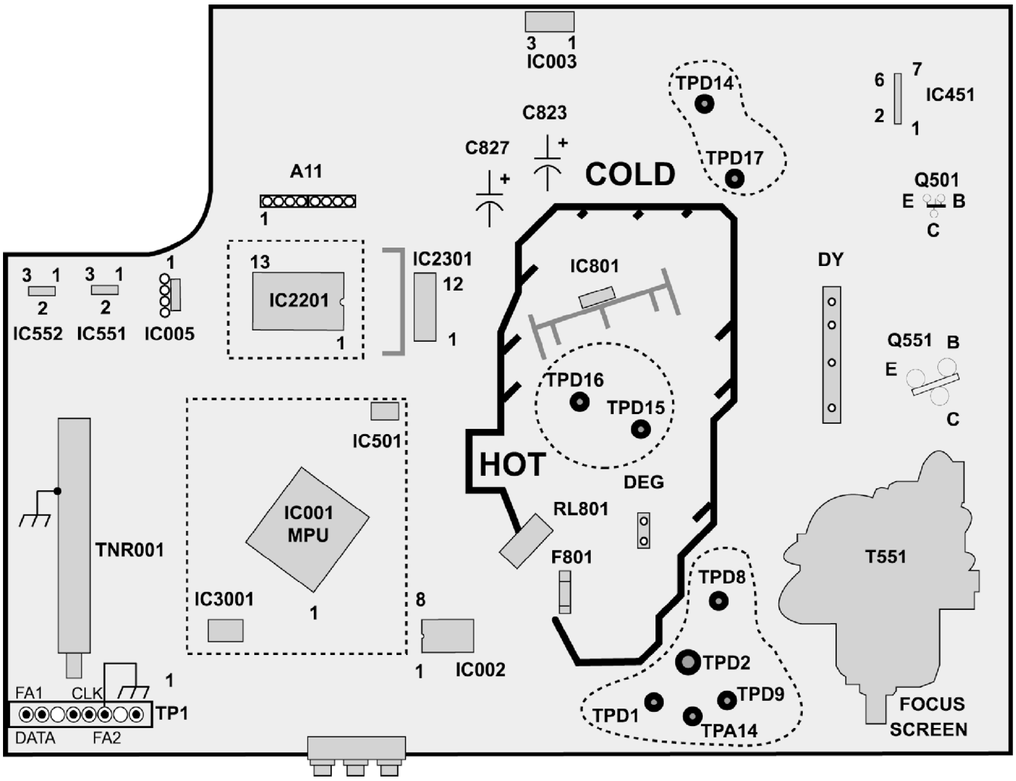
9. Chassis service adjustment procedures

All service adjustments are factory preset and should not require adjustment unless controls and/or associated components are replaced.

Note:

Connect the (-) lead of the voltmeter to the appropriate ground. Use IC801's heat sink when the HOT ground symbol is used. Otherwise, use COLD ground (tuner shield, IC451's heat sink or FA2).

Component and voltage test points


3 1
IC003
TPD14
C823
C827
COLD
TPD17
6
7
IC451
2
1
Q501
E
B
C
A11
1
IC2301
12
1
13
IC2201
1
3 1
2
IC552
3 1
2
IC551
1
IC005
IC801
DY
Q551
B
E
C
TPD16
TPD15
IC501
HOT
DEG
RL801
IC001
MPU
TNR001
F801
T551
TPD8
IC3001
1
8
1
IC002
TPD2
TPD9
TPD1
TPA14
FOCUS
SCREEN
FA1
CLK
1
TP1
DATA
FA2

Note:

Components and test points within doted areas are located on trace side.

B+ voltage check

1. **Set the BRIGHT and PICTURE to minimum by using the PICTURE menu.**
2. **Connect the DVM between C825 (+ side) or TPD14 and cold ground.**
3. **Confirm that B+ voltage is 131.0V ± 2.0V. This voltage supplies B+ to the horizontal output and flyback circuits.**

Source voltage chart

120V AC line input. Set the BRIGHT and the PICTURE to minimum by using the PICTURE menu. Use cold or hot ground for the (-) lead of the DVM as needed.

A-BOARD	TEST POINT	VOLTAGE
+B2	TPD14	131.0 ± 2.0V
SOUND	C823 (+)	22.7 ± 1.0V
STB12V	C827 (+)	12.8 ± 1.0 V
220V	TPA14	200 ± 10 V
VERTICAL	TPD8	27.4 ± 1.5V
9V	IC551 pin 3	9.0 ± 0.5V
5V	IC552 pin 3	5.0 ± 0.5V
3.3V	IC005 pin 2	3.3 ± 0.3V
EHT	CRT anode	27.7 ± 1.25kV
HEATER	JK351 H-HGND	6.3 ± 0.24V

High voltage check

1. **Select an active TV channel and confirm that horizontal is in sync.**
2. **Adjust BRIGHTNESS and CONTRAST using PICTURE icon menu so video just disappears.**
3. **Using a high voltage meter confirm that the high voltage is 27.7 ± 1.25kV.**

10. Service mode (electronic adjustments)

This receiver has electronic technology using the I2C bus concept. It performs as a control function and it replaces many mechanical controls. Instead of adjusting mechanical controls individually, many of the control functions are nowperformed by using "on screen display menu". (The service adjustment mode).

NOTE
It is suggested that the technician reads all the way through and understand the following procedure for entering/exiting the service adjustment mode; then proceed with the instructions working with the receiver. When becoming familiarwith the procedure, the flow chart for service mode may be used as a quick guide.

Quick entry to service mode

When minor adjustments need to be done to the electronic controls, the method of entering the service mode without removal of the cabinet back is as follows using the remote control:

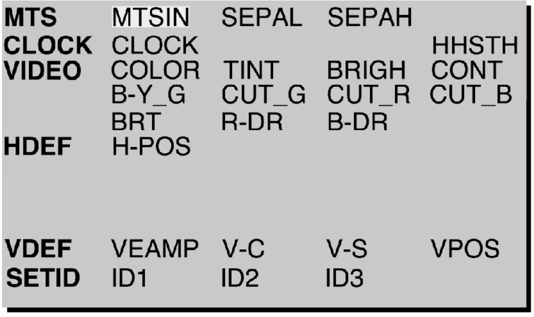
1. **Select SET-UP icon and select CABLE mode.**
2. **Select TIMER icon and set SLEEP time for 30 Min.**
3. **Press "ACTION" twice to exit menus.**
4. **Tune to the channel 124.**
5. **Adjust VOLUME to minimum (0).**

6. Press VOL → (decrease) on receiver. Red “CHK” appears in upper corner.

To toggle between aging and service modes:

While the “CHK” is displayed on the left top corner of the CRT, pressing “ACTION” and “VOL” UP on the TV simultaneously will toggle between the modes. Red “CHK” for serviceand yellow “CHK” for aging.

7. Press POWER on the remote control to display the service adjustment modes menu, select adjustment by pressing the volume right/left buttons and channel up/down buttons on the remote and ACTION to enter the adjustment.



MTS	MTSIN	SEPAL	SEPAH	
CLOCK	CLOCK			HHSTH
VIDEO	COLOR	TINT	BRIGH	CONT
	B-Y_G	CUT_G	CUT_R	CUT_B
	BRT	R-DR	B-DR	
HDEF	H-POS			
VDEF	VEAMP	V-C	V-S	VPOS
SETID	ID1	ID2	ID3	

Exiting the service mode:

This TV goes out from service mode when it is unplugged or turned OFF. To exit the service mode, turn the TV OFF from or unplug the TV from A.C.

Other method

Press ACTION and POWER on the receiver simultaneously for at least 2 seconds.
The receiver momentarily shuts off; then comes back on tuned to channel 3 with a preset level of sound.
Any programmed channels, channels caption data and some others user defined settings will be erased when exited by pressing ACTION and POWER on receiver.

IMPORTANT NOTE

Always check that the TV exits the service mode.

To confirm colors

When in service mode (red “CHK” is displayed) press RECALL on the remote control to enter the purity field check mode

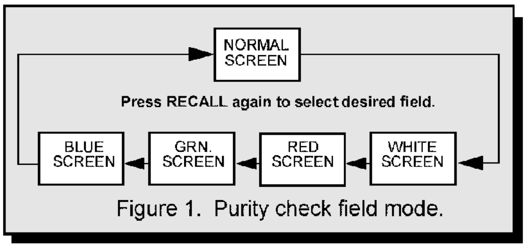


Figure 1. Purity check field mode.

Entering service mode (open-back method)

While the receiver is connected and operating in normal mode, momentarily short test point FA1 (TP1 pin 2) to cold ground (TP1 pin 3).
The receiver enters the aging mode.
Yellow letters “CHK” appear in the upper left corner of the screen. / (The volume right/left and channel up/down will adjust rapidly).

Note:

If service mode is accessed by this method be sure to reset the set after service is performed.

10.1. Service adjustment default values for items

NAME	DESCRIPTION	REGISTER VALUE
MTSIN	MTS INPUT LEVEL	28
SEPAL	MTS LOW LEVEL SEPARATION	0C
SEPAH	MTS HIGH LEVEL SEPARATION	26
CLOCK	CLOCK	120
HHSTH	HHS VOLTAGE LEVEL REFERENCE	B1
COLOR	COLOR	00 F0
TINT	TINT	56
BRIGH	SUB-BRIGHTNESS	56
CONT	SUB-CONTRAST	38
B-Y_G	MAGENTA TINT ADJ	80
CUT_G	GREEN CUT-OFF	01 7F
CUT_R	RED CUT-OFF	01 26
CUT_B	BLUE CUT-OFF	01 21
BRT	BRIGHT	56
R-DR	RED DRIVE	0A 23
B-DR	BLUE DRIVE	08 D3
H-POS	HORIZONTAL POSITION	82
VEAMP	VERTICAL SIZE	44
V-C	VERTICAL LINEARITY	56
V-S	VERTICAL SIZE CORRECTION	0C
VPOS	VERTICAL POSITION	7F
ID1*	ID SWITCH 1	F8
ID2*	ID SWITCH 2	1F
ID3*	ID SWITCH 3	7B

IMPORTANT:

These table values are approximated and could change due to variation of electrical characteristics in each set, except for the ID switch values.

***Note:**

The correspondent ID switch (ID1, ID2, ID3) data configuration should not be modified in any way. If EEPROM circuit needs to be replaced, these ID values should be configured according with this table.

11. Service adjustments (electronic controls)

NOTE

Please correlate with available pattern on all adjustments

11.1. Sub-Brightness and Contrast / Service DAC adjustment (BRIGH, CONT)

Adjustment of this control is important for setting proper operation of customer brightness and picture controls. Do not adjust the SCREEN VR after the sub-brightness is set.

This adjustment is factory set. Do not adjust unless repairs are made to associated circuit, the CRT Board or when the CRT is replaced.

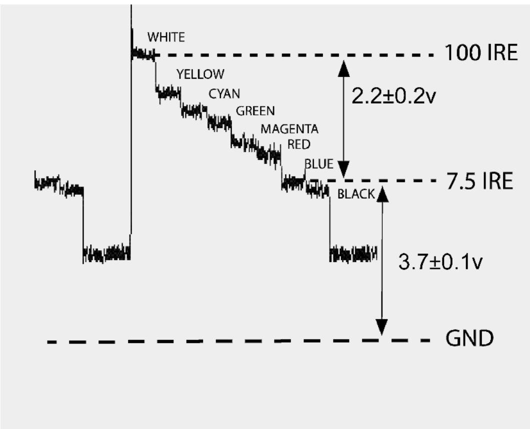
Preparation

1. **Apply a colorbar pattern.**
2. **Set the PICTURE control to the maximum.**
3. **Set COLOR control to minimum (no color on picture).**
4. **Set the BRIGHTNESS control to the center.**
5. **Set the SHARPNESS control to the center.**
6. **Connect the oscilloscope to TP35 (or TP47G).**

Procedure

1. **In the service mode, select DAC for brightness adjustment “BRIGH”, and adjust data to obtain 3.7±0.1V between 7.5 IRE and GND level at TP35 (TP47G). (See waveform detail).**
2. **In service mode, select DAC for contrast adjustment “CONT”, and adjust data to obtain 2.2±0.1V between 7.5IRE and 100IRE level at**

TP35 (TP47G). (See waveform detail).



11.2. Color output adjustment / Service DAC adjustment (COLOR, TINT)

NOTE

if a rainbow pattern generator is available perform the following procedure; the next section describes the procedure with no rainbow pattern.

Make sure that sub-contrast adjustment was finished prior to perform this adjustment.

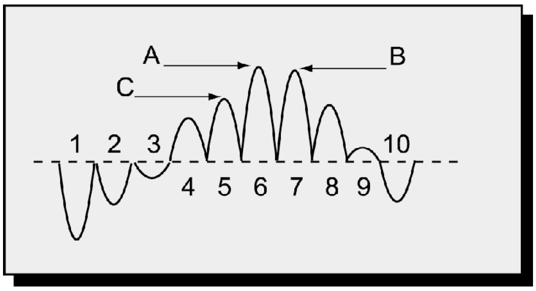
PREPARATION

1. **Normalize the picture settings.**
2. **Set the BRIGHTNESS control to minimum.**
3. **Set the COLOR control to the center.**
4. **Set the TINT control to the center.**
5. **Set the PICTURE control to the maximum.**
6. **Set the SHARPNESS control to the minimum.**

PROCEDURE

1. **Apply a rainbow color bar pattern.**
2. **Connect the oscilloscope to TP37 (or TP47B).**
3. **In service mode adjust “TINT” register until the waveform measured is as the one shown. Tint level from A and B peaks must be at the same level.**

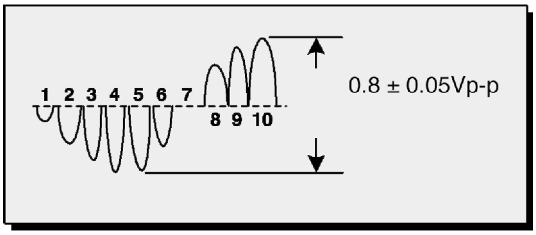
TP37 Waveform (TP47B).



4. Connect the oscilloscope to TP35 and GND.

5. Adjust “COLOR” register so that the amplitude is 0.8 ± 0.05Vp-p (see figure below).

TP35 Waveform (TP47G).



11.3. Color output adjustment / Service DAC adjustment / (COLOR, TINT, B-Y_G)

NOTE

Color and tint adjustment sets the reference settings for the user controls; It is important to read the procedures.

(NO RAINBOW PATTERN)

Make sure that sub-contrast adjustment was finished prior to perform this adjustment

PREPARATION

Normalize the picture settings.

PROCEDURE

1. Apply a color bar pattern.

2. In service mode adjust “R DR” and “B DR” data to “80”.

3. In service mode adjust “TINT” data so that the color does not become greenish or redish.

4. In service mode adjust “COLOR” data so that the color level is not

too high (saturated) or too low (tending to black and white).

5. In service mode adjust "B-Y G" data so that blue and green seem natural.
6. Confirm that saturation and picture are normal (normal image).
7. If image is not satisfactory, repeat adjustment until the image is normal and natural.

NOTE
The image can be compared against other set to see the image quality.

11.4. Color temperature adjustment / (B / W Tracking) / Service DAC Adjust. / (CUT R) (CUT G) (CUT B) (R DR) (B DR)

Minor Touch-Up Method

OBSERVE low and high brightness areas of a B/W picture for proper tracking. Adjust only as required for "good gray scale and warm highlights".

1. LOW LIGHT areas - In service mode for making electronic adjustments, select CUT R, CUT G, CUT B and adjust the picture for gray.
2. HIGH LIGHT areas - In service mode for making electronic adjustments, select drive R DR, B DR and adjust the picture for warm whites.

Complete adjustment

PREPARATION

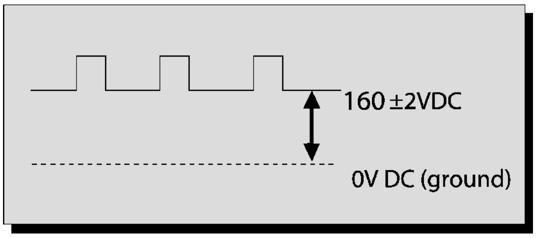
1. Turn the receiver "ON" and allow 30 minutes warm up at WHITE PATTERN.
2. Apply a color bar pattern (with no color).
3. Turn the SCREEN control (part of FBT T551) fully counterclockwise.
4. Preset the following service DACs for best results:

   - BRIGH________________________1 D0
   - CUT R________________________02 00

- CUT G________________________02 00
- CUT B________________________02 00
- R DR_________________________07 FF
- B DR_________________________07 FF

PROCEDURE

1. Connect the oscilloscope to KG (CRT-Board).
2. In service mode for making electronic adjustment, select “BRIGH” DAC.
3. Press RECALL button on the remote control to collapse the raster. (service SW).
4. Connect oscilloscope to KG on C-Board and adjust service mode “CUT-G” DAC until 160 ± 2V above DC ground is measured.
5. Remove the probe from KG.
6. Turn screen clockwise slowly until color is slightly appeared.
7. Then adjust “CUT R” and “CUT B” until line becomes white.
8. Press RECALL button on the remote to restore the raster.
9. Adjust “R DR” and “B DR” so the white seems like white and black like black.
10. Apply a normal signal and confirm that the image is normal and a good gray scale.
11. If correction is needed perform minor touch-up method.



11.5. Deflection adjustments

To reset deflection adjustments

To reset deflection adjustments to factory adjusted default, enter to service mode (with red CHK

displayed), press POWER button on remote to display the service menu, then press and hold RECALL button for at least three seconds, a reset message will appear in the image.
Use this feature when deflection adjustment gets off adjustment to the point that it cannot be adjusted back easily.

11.5.1. H-Center adjustment

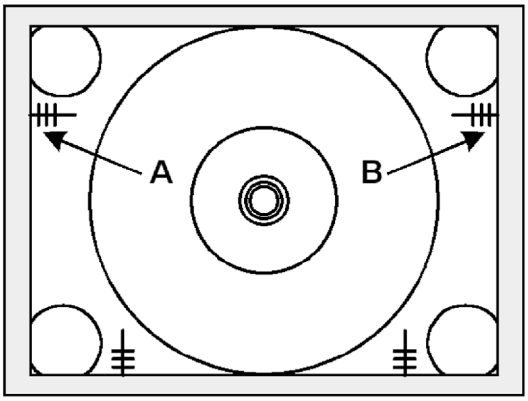
PREPARATION

1. **Apply a crosshatch pattern.**
2. **Normalize the picture settings.**

PROCEDURE

1. **Apply a monoscope pattern to center the picture.**

Horizontal Center Adjustment



2. **If the horizontal center is not aligned, in service mode adjust “H POS” DATA to adjust the horizontal center of the pattern to the CRT center.**
3. **Check with a normal image that the picture is centered.**

11.5.2. Horizontal width adjustment / (H-WID)

PREPARATION
Apply a pattern that permits the centering of the image.

Procedure:

1. **Adjust “VRAS” data so that the picture is in the center and lines are straight (check mark on CRT sides).**

2. Apply a crosshatch pattern.
3. Adjust “PCC” data to make lines straight.
4. Adjust “H-WID” data to correct vertical size of the image.
5. Adjust “VEAMP” data to correct vertical size of the image.

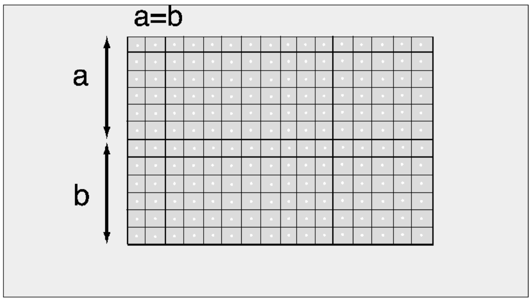
11.5.3. Vertical linearity(V-C), V-Size and V-Position adjustment

PREPARATION

1. Apply a crosshatch pattern
2. Normalize the picture settings.

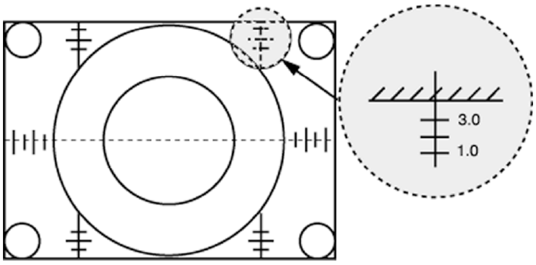
PROCEDURE

1. Enter service mode, select DAC adjustment / “V-POS” and adjust monoscope pattern to the center vertical position of the CRT center mark.
2. Adjust linearity data “V-C” so that interval of “a” is same as “b” (a= b).



3. If the v-position is not at the CRT center, adjust / V position “V POS” DATA again.
4. Apply a monoscope pattern.
5. Confirm that center horizontal line is in center mark on CRT.
6. Adjust “VEAMP” register for correct vertical size by making monoscope round circle leaving 4 marks off the CRT edge.

Vertical centering adjustment.



11.5.4. V-S Correction adjustment

PREPARATION

1. Apply a crosshatch pattern
2. Normalize the picture settings.

PROCEDURE

1. Enter to service mode
2. Check a and b sizes, If b-a < -1.5mm (in top & bottom extending case)

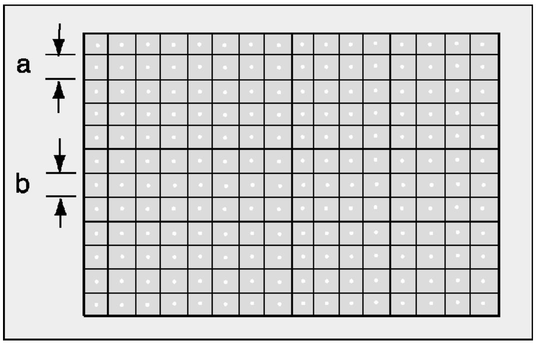
   - Increase “V-S” DATA by one step

NOTE

Repeat “a” and “b” until b-a ± 1.5mm

3. Confirm to make outermost circle of monoscope pattern a correct circle

V-Adjustment



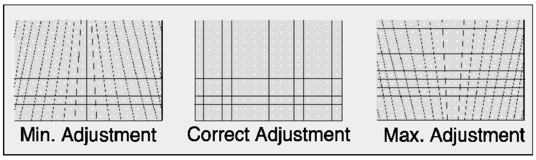
11.5.5. Trapezoid adjustment (TRAP)

PREPARATION

1. Apply a crosshatch pattern.
2. Normalize the picture icon video adjustments.

Procedure:

1. Enter service mode, select “TRAP” and adjust DATA so that lines at right and left are vertical like a solid line.


Min. Adjustment
Correct Adjustment
Max. Adjustment

11.5.6. PCC adjustment (PCC)

This adjustment helps to correct left and right curved sides of picture.

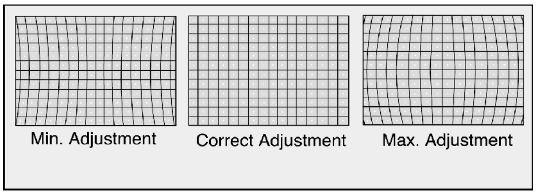
PREPARATION

1. Apply a crosshatch pattern.
2. Normalize the picture icon video adjustments.

Procedure:

1. Adjust “PCC” data so that the first and third line make a good balance (see figure below).

PCC Adjustment


Min. Adjustment
Correct Adjustment
Max. Adjustment

11.5.7. Corner PCC adjustment / (TOPG, TOPSL, BTMG, BTMSL)

This controls help to adjust top and bottom sides of picture.

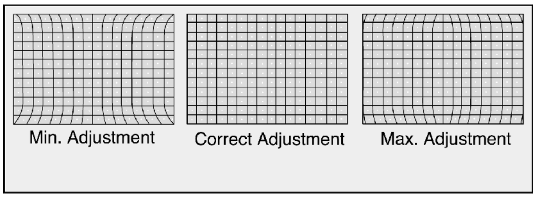
PREPARATION

1. Apply a crosshatch pattern.
2. Normalize the picture icon video adjustments.

Procedure:

1. Adjust “TOPG” and “TOPSL” data to correct upper side of the image linearity.
2. Adjust “BTMG” and “BTMSL” data to correct lower side of the image (see figure below).

Top and bottom adjustment


Min. Adjustment
Correct Adjustment
Max. Adjustment

11.6. MTS circuit adjustments

The MTS circuit adjustments require two steps:

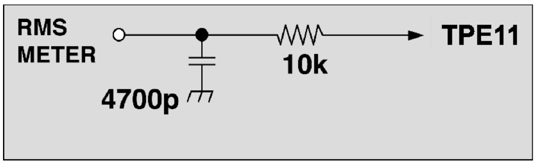
1. Input level adjustment.
2. Stereo separation adjustment.

Input level adjustment / Service DAC adjustment (MTSIN)

PREPARATION

1. Connect an RMS meter with filter jig as shown in figure to TPE11.

Filter Jig


RMS METER
10k
TPE11
4700p

2. Connect an RF signal generator to the RF antenna input.

PROCEDURE

1. Apply the following signal from the RF signal generator:

   - Video: 100 IRE flat field, 30% modulation.
   - Audio: 300Hz, 100% modulation, monaural (70 ±5dB, 75 Ω

OPEN, P/S 10dB). Make sure that the 75 μ s pre-emphasis is OFF.

2. **Adjust the MTS input level adjustment "MTSIN" data until the RMS voltage measured is 120 ± 4.0mVrms.**

Stereo separation adjustment (SEPAH)

PREPARATION

1. **Connect an R.F. signal generator to the RF antenna input.**
2. **Connect a scope to TPE10.**

PROCEDURE

1. **Select stereo mode in audio menu**
2. **Apply the following signal from the RF signal generator:**
   - **Video: 100 IRE flat field, 30% modulation.**
   - **Audio: 300Hz, 30% modulation, stereo (left only) (70±5dB, 75 Ω OPEN, P/S 10dB).**

   NOTE
   After setting 30% modulation with P.L. SW and N.R. SW OFF, turn P.L. SW and N.R. SW ON.

3. **In service mode, adjust the MTS Low-Level separation adjustment "SEPAL" data until the amplitude displayed on the scope is minimum.**
4. **Apply the following signal from the RF signal generator:**
   - **Video: 100 IRE flat field, 30% modulation**
   - **Audio: 3KHz, 30% modulation, stereo (left only) (70 ±5dB, 75 Ω OPEN, P/S 10dB).**

   NOTE
   After setting 30% modulation with P.L. SW and N.R. SW OFF, turn P.L. SW and N.R. SW ON.

5. Adjust the MTS High-level separation adjustment “SEPAH” until the amplitude displayed on the scope is minimum.
6. Repeat above steps 2 through 5 until the amplitude is at minimum for both signals.

11.7. Clock adjustment (CLOCK)

PREPARATION

Connect the frequency counter from TP017 / (IC001 pin 79) to cold ground

PROCEDURE

1. Turn the receiver “OFF” with the A.C. power applied.
2. Measure TP017 (IC001 pin 79) for the frequency of the waveform and record the reading.

NOTE

3. TP017 (IC001 pin 79) measurement must have at least four digits of resolution following the decimal point. Example: 000.0000
4. Place the receiver into service mode for making electronic adjustment, select the clock adjustment DAC “CLOCK”.
5. Calculate and set “CLOCK” based on the following formula:

$$\boxed{\text{CLOCK} = 128 - \left[\frac{(\text{TP017}_{freq} - 610.35)}{610.35} \times 450000\right]}$$

NOTE

TP017 (IC001 pin 79) measurement will not change regardless of the value stored in CLOCK.

11.8. Service Adjustments Mechanical Controls

WIDTH CORRECTION ADJUSTMENT

Note

Perform this adjustment only when FBT is changed.

FOCUS (PART OF T551)

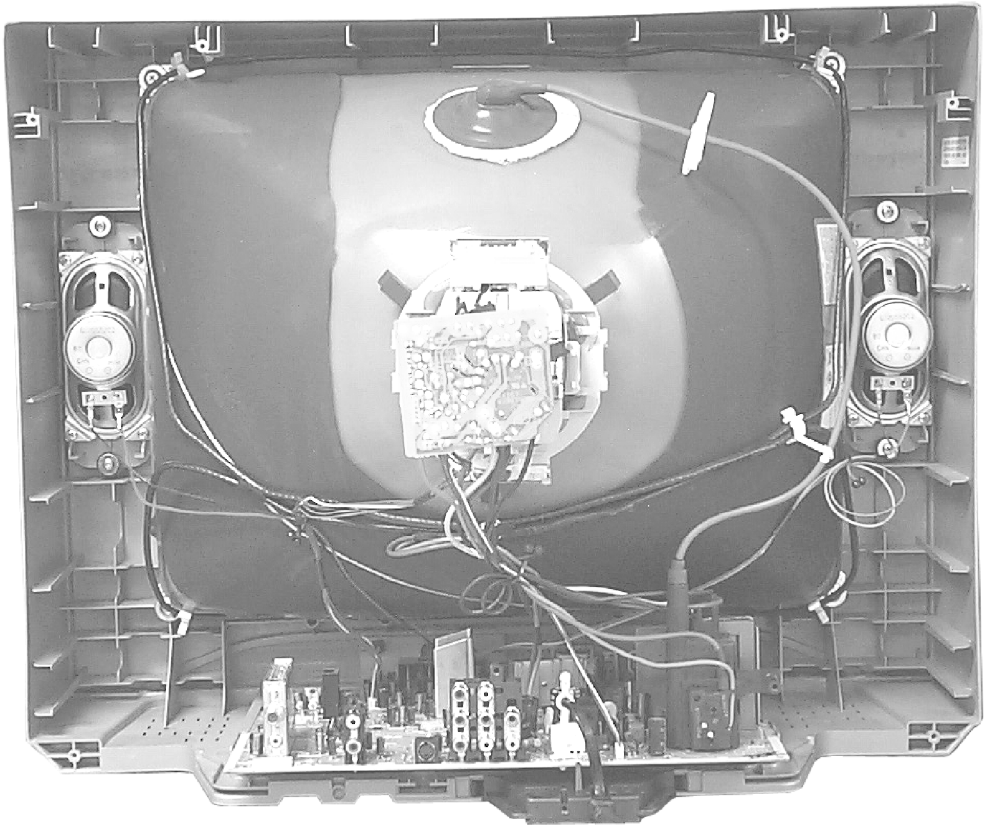
Preparation
Apply a crosshatch pattern with dots.

Procedure

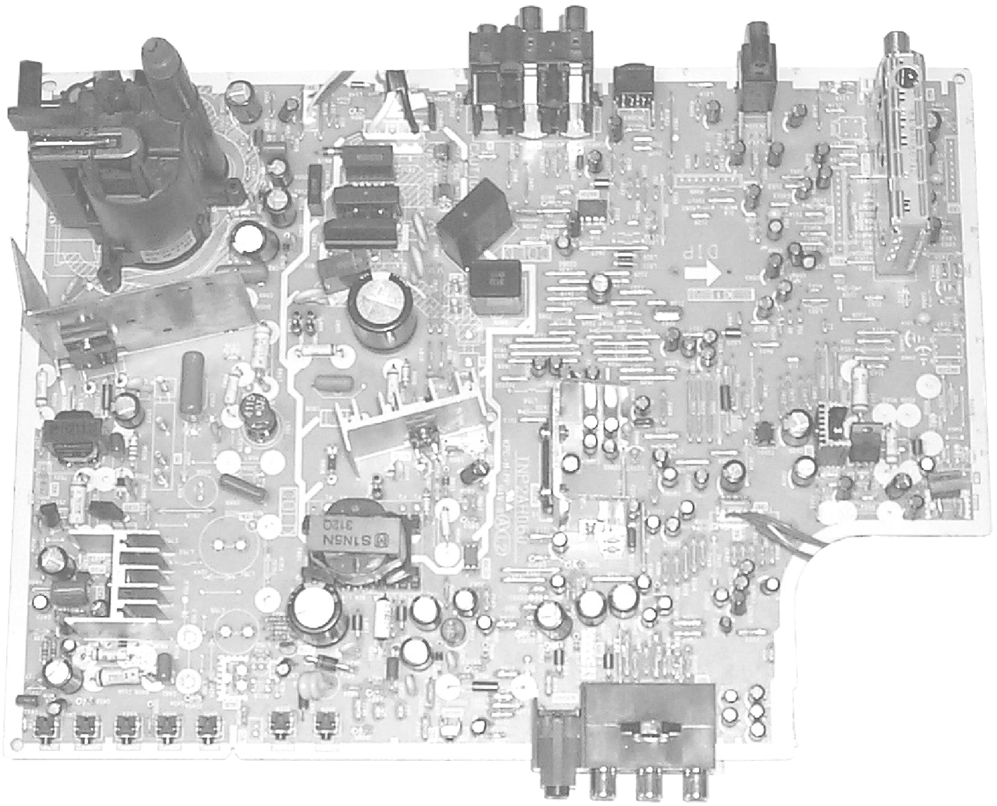
1. **Adjust the FOCUS VR to obtain the sharpest and clearest dot pattern.**
    - **Adjust for best center.**
    - **Adjust for best area between the center and top right corner.**

12. Identification of components

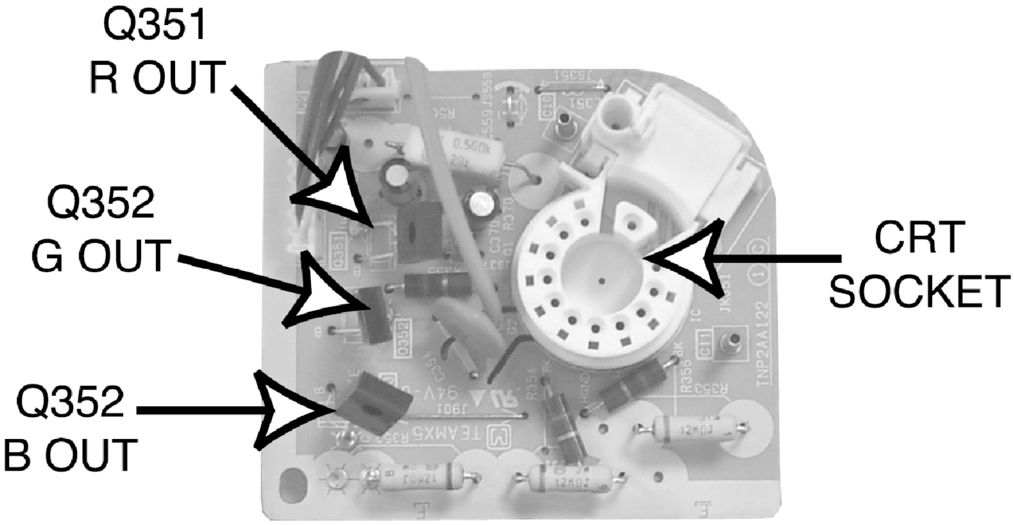
12.1. Chassis Components



12.2. A-Board Chassis



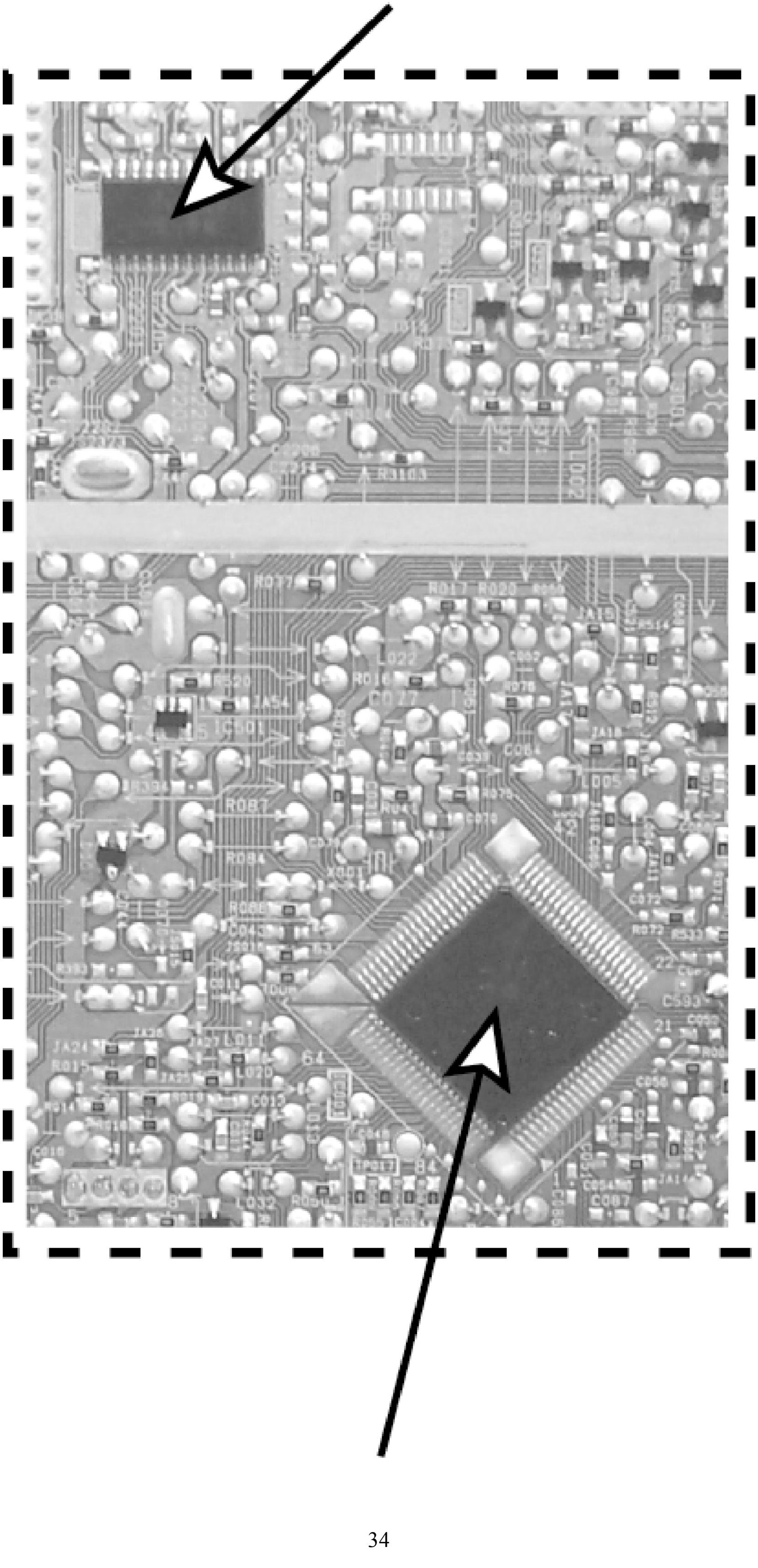
12.3. C-Board Chassis


Q351
R OUT
Q352
G OUT
Q352
B OUT
CRT
SOCKET

12.4. A-Board surface-mounted components

A-Board (bottom side)

IC2201


R3103
R077
R017
R020
R520
JA54
IC501
R087
R084
R088
C043
LD11
L020
C012
C593
64
84
22
21

IC001

13. Reference for PDF colors

DESCRIPTION OF PDF LINK COLORS	
TYPE	DESTINATION
SCHEMATIC	
YELLOW ON IC	IC ON PCB
YELLOW ON CONNECTOR	CONNECTOR ON PCB
YELLOW ON SCHEMATIC	PCB
CYAN	WAVEFORM
GREEN ON SIDE	SCHEMATIC CONTINUED
GREEN ON CONNECTOR	CONNECTOR CONNECTION
BLUE ON IC	VOLTAGE
PCB	
BLUE ON IC	IC ON SCHEMATIC
BLUE ON CONNECTOR	CONNECTOR ON SCHEMATIC
BLUE ON PCB	SCHEMATIC
GREEN ON SIDE	PCB CONTINUED
BLOCK DIAGRAMS	
GREEN ON IC	IC ON SCHEMATIC
GREEN ON SIDE	BLOCK DIAGRAM CONTINUED

14. Conductor views

14.1. A-Board printed circuit (left side)

14.2. A-Board & C-Board printed circuit (right side)

15. Block diagrams

15.1. Video signal block diagram

15.2. Audio signal block diagram

16. Schematics

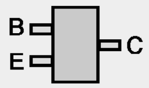
16.1. English schematic notes

Notes:

IMPORTANT SAFETY NOTICE

THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES THAT ARE IMPORTANT FOR PROTECTION FROM X-RADIATION, FIRE AND ELECTRICAL SHOCK HAZARDS. WHEN SERVICING IT IS ESSENTIAL THAT ONLY MANUFACTURERS SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS DESIGNATED WITH A ⚠ IN THE SCHEMATIC.

CHIP TRANSISTOR LEAD DESIGNATION



SCHEMATIC NOTES

1. Resistors are carbon 1/4W unless noted otherwise.
2. Capacitors are ceramic 50V unless noted otherwise.
3. Coil value notes is inductance in µH.
4. Test point indicated by ⫯ ; Test point but no pin ⫯.
5. Components indicated with ⚠ are critical parts and replacement should be made with manufacture specified replacement parts only.
6. ▬ (**BOLD LINE**) indicates the route of B+ supply.
7. The schematic diagrams are current at the time of printing and are subject to change without notice.
8. Ground symbol ⏚ indicates **HOT GROUND CONNECTION**; ⏚ indicates COLD GROUND.

NOTE: All other component symbols are used for engineering design purposes.

VOLTAGE MEASUREMENTS

1. Voltage measurement:
    - AC input to the Receiver is 120V. NTSC (HD, 1125i & 525P when applicable) signal generator is connected to the antenna of the Receiver. (Color bar pattern of 100 IRE white and 7.5 IRE black.)
    - All Picture and Audio adjustments are set to Normalize.
      TV ANT/CABLE - (Set-Up Menu) in TV/ANT Mode
      Volume - Min.
      TV/Video SW - TV position
      Audio Mode - Stereo
    - Voltage readings are nominal and may vary ±10% on active devices. Some voltage reading will vary with signal strength and picture content.
    - Supply voltages are nominal.
2. Ground symbol ⏚ indicates ground lead connection of meter.
   Incorrect ground connection will result in erroneous readings.

CAUTION: ***Incorrect ground connection of the test equipment will result in erroneous readings.***

WAVEFORM MEASUREMENTS

1. ③ indicates waveform measurement. (Measurement can be taken at the best accessible location in common to the indicated point.)
2. Taken with an NTSC signal generator connected to the antenna terminal. (NTSC color bar pattern of 8 bars of EIA colors, 100 IRE white and 7.5 IRE black.)
3. Customer Controls (Picture/Audio Menu) are set to Normalize. Volume is set to “MIN”.
4. All video and color waveforms are taken with a wideband scope and a probe with low capacitance (10 to 1). Shape and peak altitudes may vary depending on the type of Oscilloscope used and its settings.
5. Ground symbol ⏚ shown on waveform number indicates (Hot) ground lead connection of the Oscilloscope.

CAUTION: Incorrect ground connection of the test equipment will result in erroneous readings.

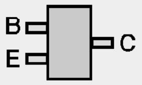
16.2. Notas de esquemáticos en español

Notas

NOTA DE SEGURIDAD

LOS DIAGRAMAS ELÉCTRICOS INCLUYEN CARACTERÍSTICAS ESPECIALES MUY IMPORTANTES PARA LA PROTECCIÓN CONTRA RAYOS-X, QUEMADURAS Y DESCARGAS ELÉCTRICAS. CUANDO SE DE SERVICIO ES IMPORTANTE USAR PARA REEMPLAZO DE COMPONENTES CRITICOS, SOLO PARTES ESPECIFICADAS POR EL FABRICANTES. LOS COMPONENTES CRITICOS ESTAN SEÑALADOS EN LOS DIAGRAMAS POR EL SIMBOLO ⚠.

IDENTIFICACIÓN DE TERMINALES PARA TRANSISTORES EN *CHIP*



NOTAS DE LOS DIAGRAMAS

1. Las Resistencias son de Carbón de 1/4W, a menos que se indique otra característica.
2. Los Capacitores son de Cerámica para 50V, a menos que se indique otra característica.
3. El valor indicado de las Bobinas es la inductancia expresada en µH.
4. Los puntos de prueba en la terminal de algún componente son indicados por ⫯ Los puntos de prueba fuera de los componentes se indican con ⫯.
5. Los componentes señalados con el símbolo ⚠ son considerados componentes críticos y deben ser reemplazados sólo con las partes especificadas por el fabricante.
6. ▬ (**LINEA GRUESA**) indica las líneas de alimentación de los Voltajes B+.
7. Los diagramas eléctricos están sujetos a cambio sin previo aviso.
8. El símbolo ⏚ indica que es una conexión a **Tierra Caliente** y el símbolo ⏚ indica conexión a **Tierra Fría**.

NOTA: Los demas símbolos de componentes incluidos son usados con fines de diseño.

MEDICIÓN DE VOLTAJES

1. Medición de voltaje:
   - El voltaje de entrada al Receptor es de 120V de Corriente Alterna. Un generador de patrones con formato NTSC se conecta a la entrada de la antena. (Patrón de Barras de Colores con 100 IREs para el Blanco y 7.5 IREs para el Negro.)
   - Los ajustes de los Menus Picture y Audio se normalizan.
     En el Menú Set-Up, en la opción ANTENA, se selecciona el modo de CABLE.
     El nivel de Volumen se minimiza.
     De los modos TV y Video, seleccionar el modo TV.
     Seleccionar modo Estereo del Audio.
   - Las mediciones de los voltajes son nominales y pueden variar hasta 10% en componentes en funcionamiento. Las lecturas de los voltajes pueden variar por la potencia de la señal y el contenido de la imagen.
   - Las fuentes de voltajes son nominales.
2. El símbolo ⏚ indica el tipo de tierra que se utiliza en la conexión del medidor.

PRECAUCION: SI no se utiliza la conexión a la tierra adecuada, se obtendrán mediciones equivocadas y podría dañar el equipo de medición.

MEDICIÓN DE FORMAS DE ONDA

1. Un símbolo como ③ indica el punto para medir una señal. (La medición puede hacerse en el punto con mayor accesibilidad, siempre que sea común al indicado.)
2. Se midieron utilizando un generador con formato NTSC conectado a la terminal de la antena. (Patrón de 8 Barras de Colores EAI, formato NTSC de 100 IREs para el Blanco y 7.5 IREs para el Negro.)
3. Los ajustes de usuario de los Menus PICTURE y AUDIO se normalizaron. Posteriormente el nivel de volumen se ajusta al mínimo.
4. Las formas de onda de Video y Color fueron tomadas con un osciloscopio de banda alta y con un punta de prueba de baja capacitancia (10 a 1). La forma y amplitud de las ondas puede variar según el tipo de osciloscopio que se utilice y sus características.
5. El símbolo de tierra ⏚ que aparece junto al número de la forma de onda, indica que se utiliza conexión a **Tierra Caliente** en el extremo negativo de la punta de prueba.

PRECAUCION: Si no se utiliza la conexión a la tierra adecuada, se obtendrán mediciones equivocadas y podría dañar el equipo de medición.

16.3. A-Board schematic TNP2AH060CD (page 1 of 5)

16.4. A-Board schematic TNP2AH060CD (page 2 of 5)

16.5. A-Board schematic TNP2AH060CD (page 3 of 5)

16.6. A-Board schematic TNP2AH060CD (page 4 of 5)

16.7. A-Board schematic TNP2AH060CD (page 5 of 5)

16.8. A-Board schematic TNP2AH060CG (page 1 of 5)

16.9. A-Board schematic TNP2AH060CG (page 2 of 5)

16.10. A-Board schematic TNP2AH060CG (page 3 of 5)

16.11. A-Board schematic TNP2AH060CG (page 4 of 5)

16.12. A-Board schematic TNP2AH060CG (page 5 of 5)

16.13. C-Board schematic TNP2AA167CB

16.14. C-Board schematic TNP2AA167CC

16.15. Voltages

16.16. Waveforms

17. Parts list

17.1. Parts list notes

Important Safety Notice

Components identified by ⚠ mark have special characteristics important for safety.
When replacing any of these components, use manufacturer's specified parts.

Abbreviation of part name and description

1. Resistor
Example :
ERD25TJ104 **C** 100KΩ, **J**, 1/4W
Type Allowance

Type	Allowance
C : Carbon	F : ± 1%
F : Fuse	G : ± 2%
M : Metal Oxide Metal Film	J : ± 5% K : ± 10%
S : Solid	M : ± 20%
W : Wire Wound	

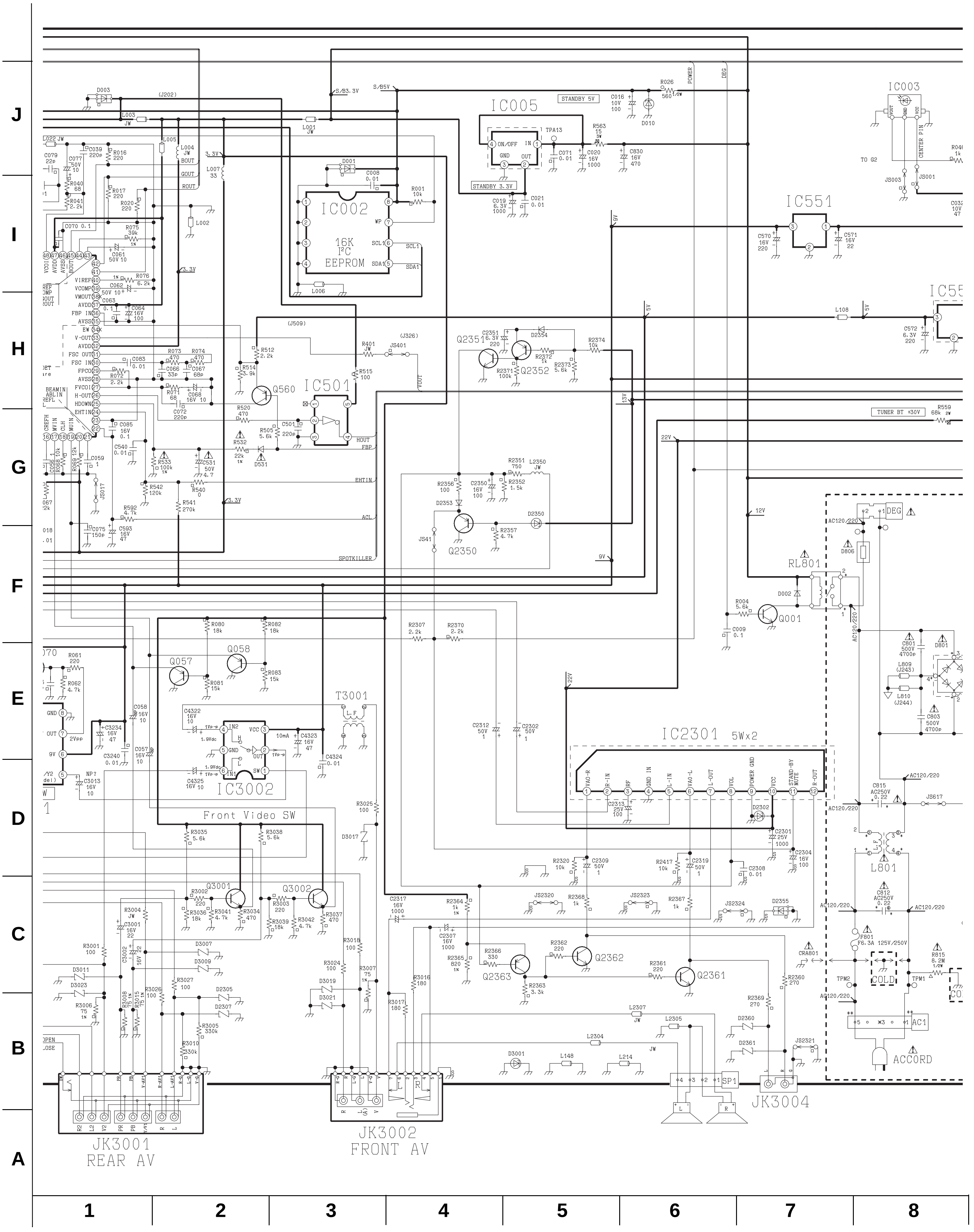
2. Capacitor
Example :
ECKF1H103ZF **C** 0.01µF, **Z**, 50V
Type Allowance

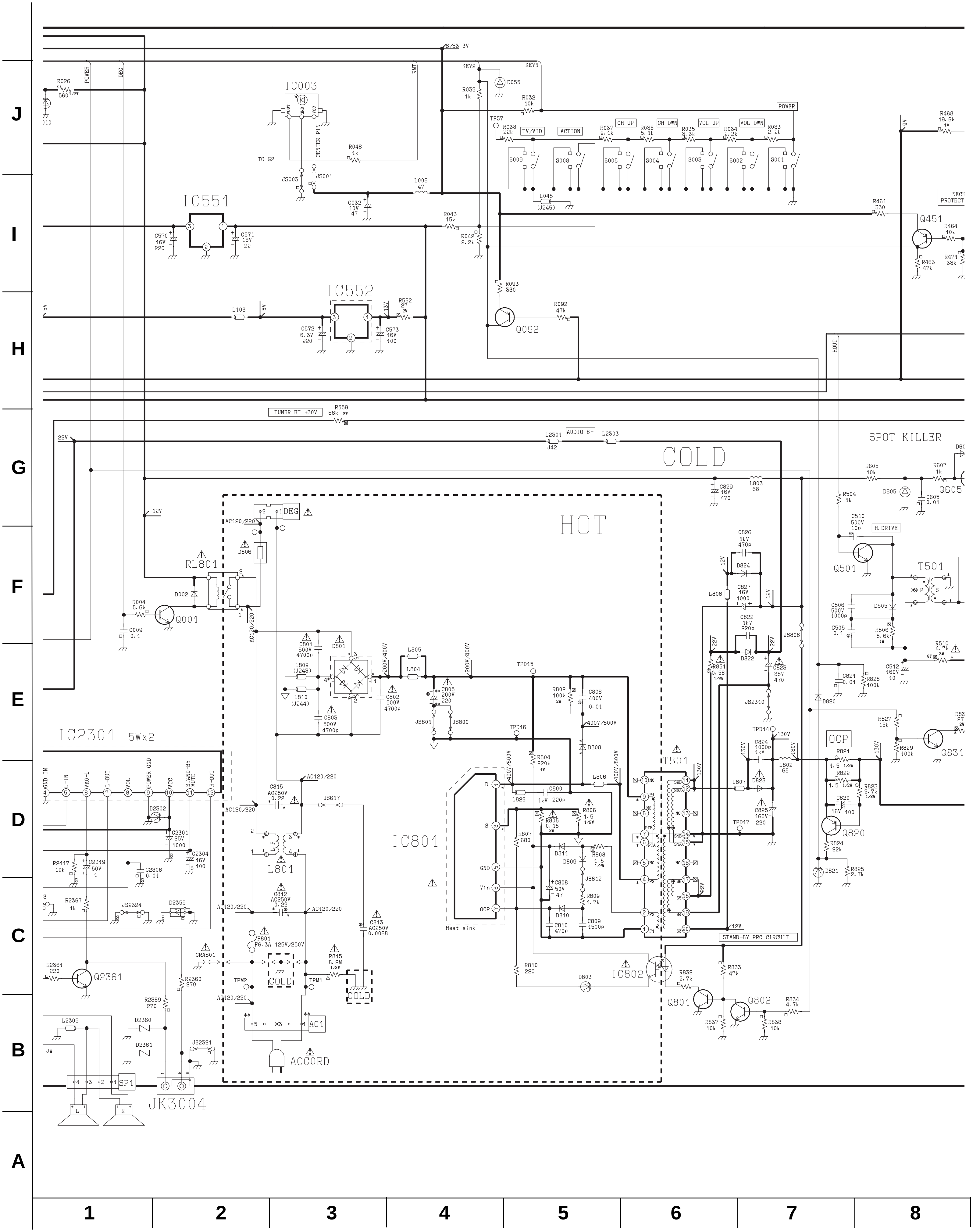
Type	Allowance
C : Carbon	C : ± 0.25pF
E : Electrolytic	D : ± 0.5pF
P : Polyester Polypropylene	F : ± 1pF G : ± 3%
T : Tantalum	J : ± 5%
	K : ± 10%
	L : ± 15%
	M : ± 20%
	P : ± 100%, -0%
	Z : ± 80%, -20%

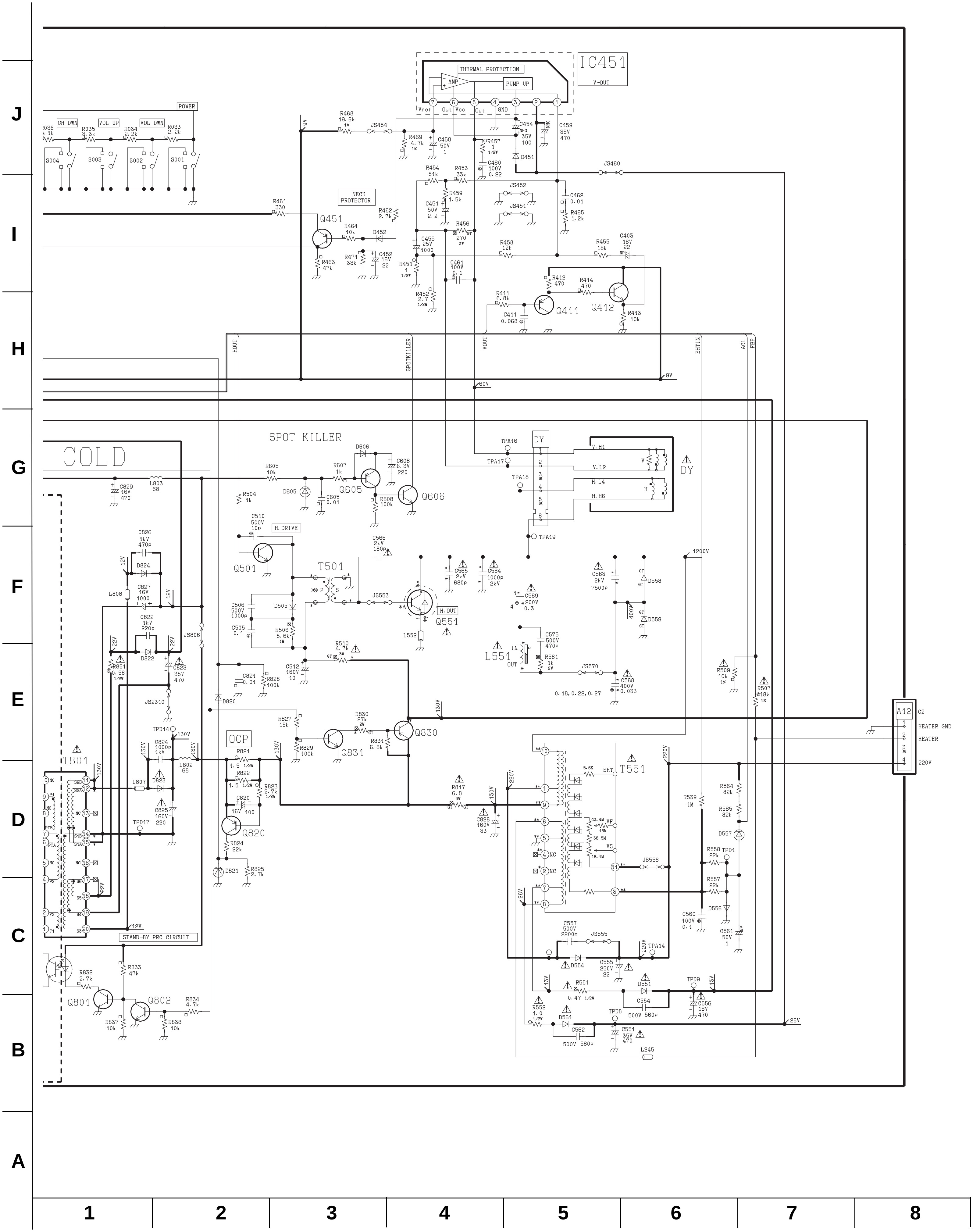
17.2. Difference Parts list

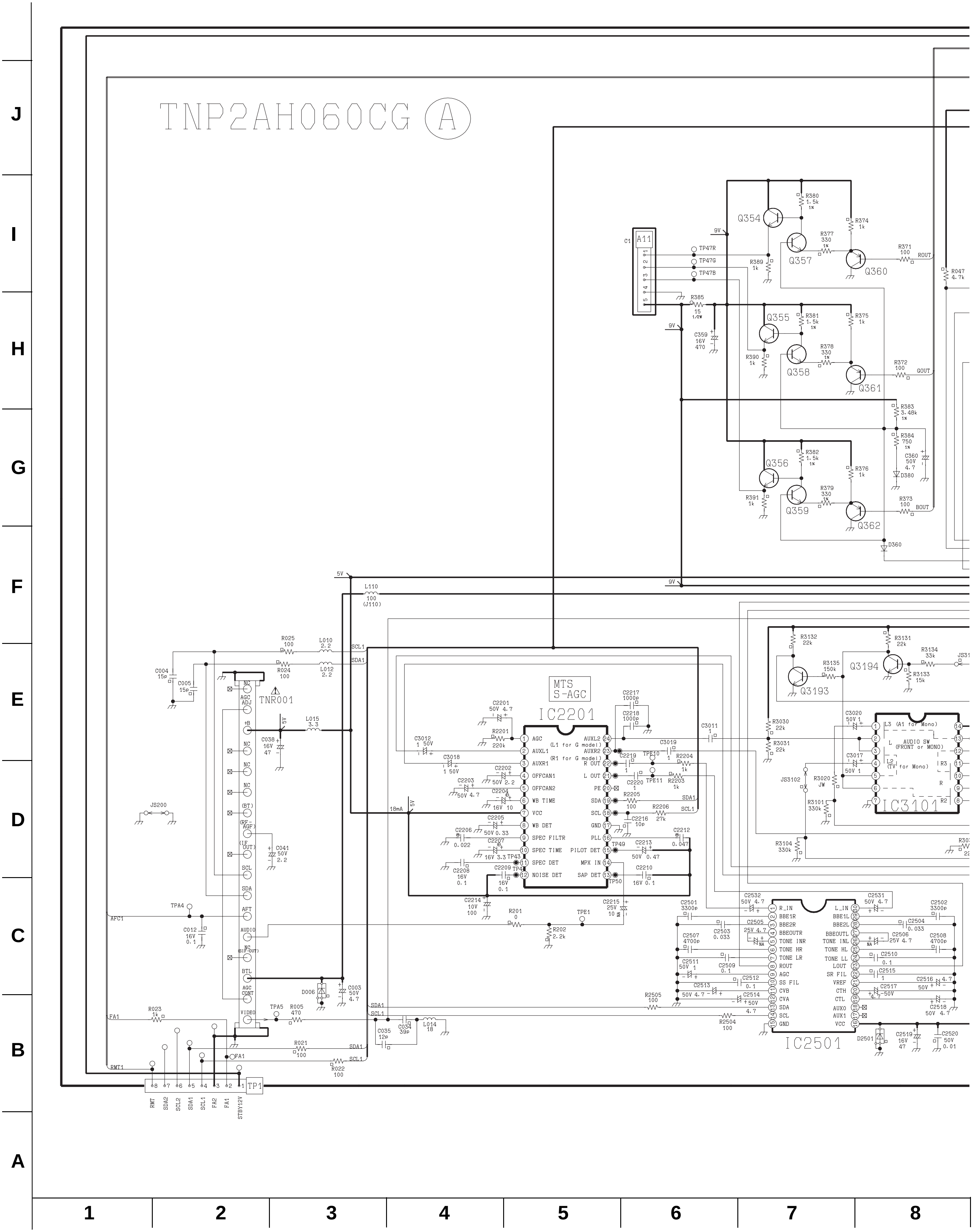
Ref. No.	Part No.	Part Name & Description	Remarks
		CAPACITORS	
C075	TCJ2VC1H151J	CAP C 150PF-J-50V	
C551	ECA1VM471B	CAP E 470UF-35V	
C556	ECA1CM222B	CAP E 470UF-16V	⚠
C563	ECWH20752JVB	CT-20SL14TJ	⚠
C563	ECWH20682JVB	CAP C .0075UF-J-200V CT-20SL14J	⚠
C565	ECKW3D681JBR	CT-20SL14TJ	⚠
C565	ECKW3D821JBR	CAP C 680PF-J-2KV CT-20SL14J	⚠
C569	ECWF2304JSR	CT-20SL14TJ	⚠
C569	ECWF2274JSR	CAP C .3UF-J-250V CT-20SL14J	⚠
C573	ECA1CM222B	CAP E 100UF-16V	
C800	ECKR3A221KBP	CAP C 220PF-K-1KV	
C809	TACCW471T50V	CAP C 1500PF-K-50V	
C812	ECQU2A224MLA	CAP P .22UF-M-250V	⚠
C813	ECQU2A682MLA	CAP P .22UF-M-250V	
C815	ECQU2A224MLA	CAP P .22UF-M-250V	⚠
		DIODES	
D605	MAZ40470HF	DIODE ZENER	
D2305	CVS20B120MTA	DIODE ZENER	
D2307	CVS20B120MTA	DIODE ZENER	
D3019	CVS20B120MTA	DIODE ZENER	

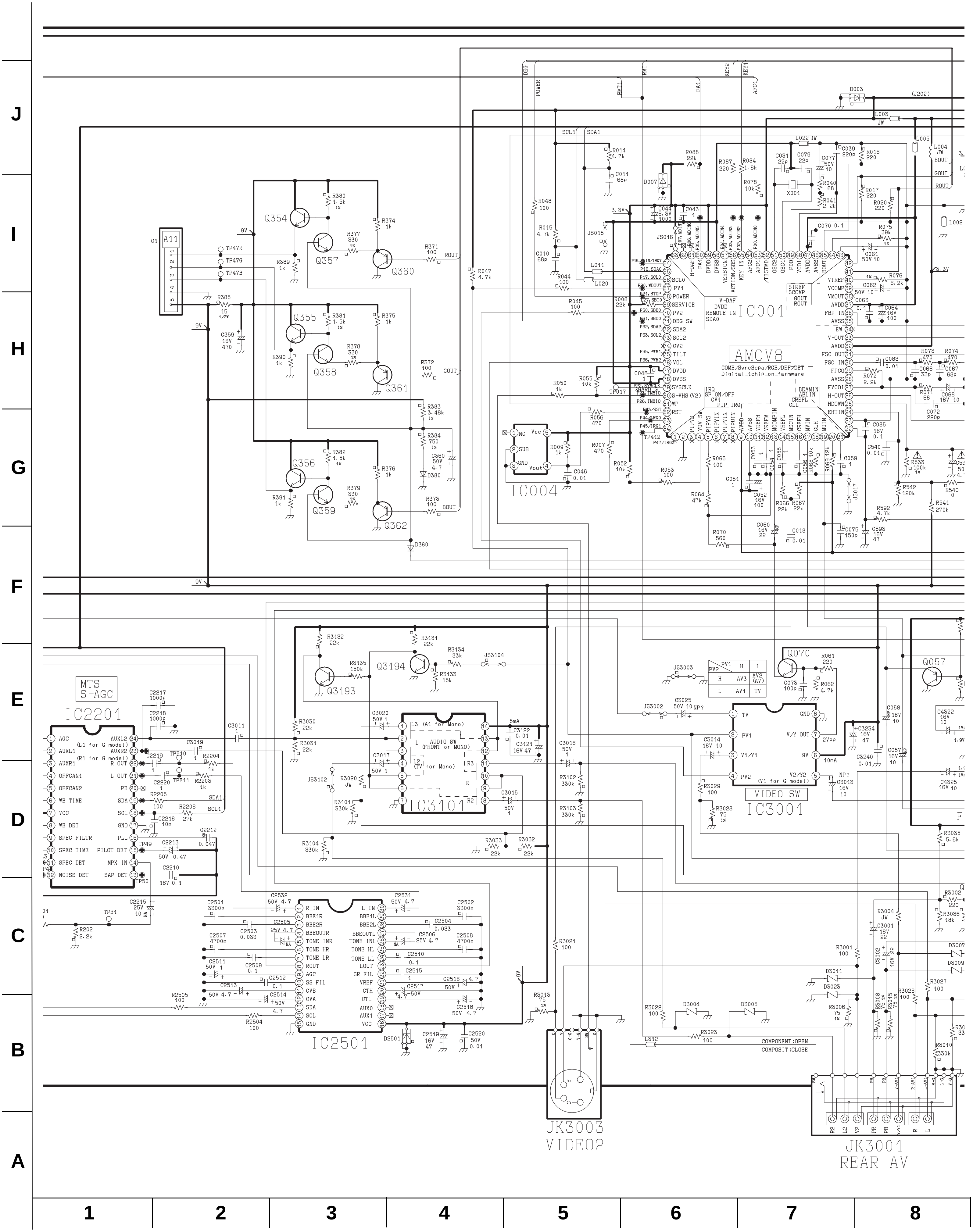
Ref. No.	Part No.	Part Name & Description	Remarks
INTEGRATED CIRCUITS			
IC001	MN101E11GTD1	INT CKT CT-20SL14J	
IC002	TVR2AJ190S	EEPROM CT-20SL14J	
IC002	TVR2AJ184S	EEPROM CT-20SL14TJ	
IC451	AN15525A	INT CKT CT-20SL14J	
IC802	PC123X2YFZ	INT CKT CT-20SL14J	
IC2501	NJW1164MTE1	INT CKT CT-20SL14J	
RESISTORS			
R350	ERQ2CJP5R6S	RES F 5.6-J-2W	⚠
R452	ERDS1FJ2R7P	RES M 2.7-1/2W	
R461	ERJ6GEYJ331V	RES M 2.7K-J-1/10W	
R2374	ERDS2TJ682T	RES C 10K-J-1/4W	
R3028	ERJ6ENF75R0V	RES M 75.0-F-1/10W	
R3029	ERJ6GEYJ101V	RES M 100-J-1/10W	
TRANSFORMERS			
T501	ETH19Y211AZ	TRANSFORMER	
OTHERS			
TNR001	ENG36A10GF	TUNER	⚠
M001	A51QDX993X	CRT CT-20SL14J	⚠
M002	A51QDX992X	CRT CT-20SL14TJ	⚠
M003	TXFKY11JSER	CABINET FRONT	
M004	TLY2AA042	DEFLECTION YOKE CT-20SL14J	
M005	TLY2AA028	DEFLECTION YOKE CT-20SL14TJ	
ACCESORIES			
M006	TQB2AA0499	MANUAL OWNERS	
M007	EUR7613ZB0	TRANSMITER REMOTE CTRL CT-20SL14J	
M008	UR76EC0303E	BATTERY COVER REMOTE CTRL EUR7613ZB0	
M009	EUR7613Z6A	TRANSMITER REMOTE CTRL CT-20SL14TJ	
M010	UR76EC0303D	BATTERY COVER REMOTE CTRL EUR7613Z6A	

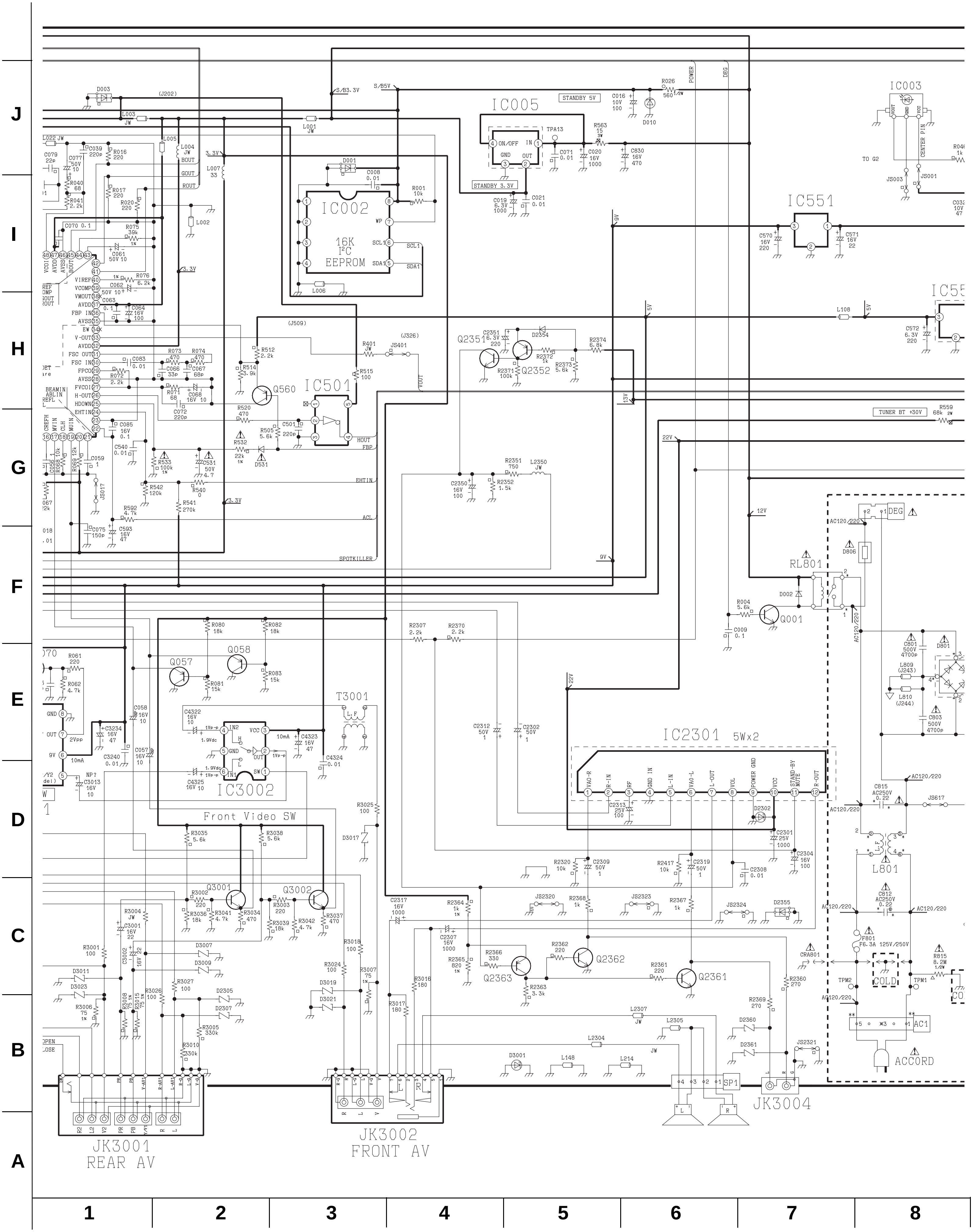

J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
IC005
STANDBY 5V
STANDBY 3.3V
IC002
16K
I²C
EEPROM
IC003
TO G2
CENTER PIN
IC551
IC501
Q560
Q2351
Q2352
Q2350
TUNER BT +30V
RL801
Q001
DEG
IC3002
T3001
Front Video SW
Q057
Q058
Q3001
Q3002
IC2301 5Wx2
Q2361
Q2362
Q2363
L801
COLD
ACCORD
AC1
SP1
JK3001
REAR AV
JK3002
FRONT AV
JK3004
POWER
DEG
S/B3.3V
S/B5V
HOUT
FBP
EHTIN
ACL
SPOTKILLER


J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
S/B3.3V
KEY2
KEY1
POWER
DEG
RMT
R026 560 1/2W
IC003
VOUT
GND
VCC
CENTER PIN
TO G2
R046 1k
JS003
JS001
R039 1k
D055
R032 10k
TPS7
R038 22k
TV/VID
ACTION
CH UP
CH DWN
VOL UP
VOL DWN
R037 9.1k
R036 5.1k
R035 3.3k
R034 2.2k
R033 2.2k
S009
S008
S005
S004
S003
S002
S001
L045 (J245)
L008 47
C032 10V 47
IC551
C570 16V 220
C571 16V 22
R043 15k
R042 2.2k
R461 330
Q451
R464 10k
R463 47k
R471 33k
R468 19.6k 1%
9V
NECK PROTECT
IC552
L108
5V
13V
R562 27 2W
C572 6.3V 220
C573 16V 100
R093 330
Q092
R092 47k
HOUT
TUNER BT +30V
R559 68k 2W
22V
L2301 J42
AUDIO B+
L2303
COLD
SPOT KILLER
R605 10k
R607 1k
D605
C605 0.01
Q605
C829 16V 470
L803 68
R504 1k
C510 500V 10p
H.DRIVE
Q501
T501
HOT
12V
DEG
AC120/220
D806
RL801
D002
R004 5.6k
Q001
C009 0.1
C801 500V 4700p
D801
L809 (J243)
L810 (J244)
C803 500V 4700p
C802 500V 4700p
200V/400V
L805
L804
C805 200V 220
JS801
JS800
TPD15
R802 100k 2W
C806 400V 0.01
400V/800V
D808
TPD16
R804 220k 1W
C826 1kV 470p
D824
L808
C827 16V 1000
C822 1kV 220p
D822
R851 0.56 1/2W
C823 35V 470
JS806
JS2310
C506 500V 1000p
D505
C505 0.1
R506 5.6k 1W
R510 4.7k 3W
C512 160V 10
C821 0.01
R828 100k
D820
R827 15k
Q831
OCP
R829 100k
IC2301 5Wx2
GND IN
L-IN
VAO-L
L-OUT
VOL
POWER GND
VCC
STAND-BY MUTE
R-OUT
D2302
C2301 25V 1000
C2304 16V 100
C2319 50V 1
C2308 0.01
R2417 10k
R2367 1k
JS2324
D2355
C815 AC250V 0.22
AC120/220
JS617
L801
C812 AC250V 0.22
C813 AC250V 0.0068
IC801
D
S
GND
Vin
OCP
Heat sink
L829
C800 1kV 220p
L806
R805 0.15 2W
R806 1.5 1/2W
R807 680
D811
D809
R808 1.5 1/2W
C808 50V 47
D810
JS812
R809 4.7k
C810 470p
C809 1500p
T801
TPD14
C824 1000p 1kV
L802 68
L807
D823
C825 160V 220
TPD17
R821 1.5 1/2W
R822 1.5 1/2W
R823 2.7k 1/2W
C820 16V 100
Q820
R824 22k
R825 2.7k
D821
STAND-BY PRC CIRCUIT
F801 F6.3A 125V/250V
CRA801
R815 8.2M 1/2W
TPM2
TPM1
R810 220
D803
IC802
R832 2.7k
R833 47k
Q801
Q802
R834 4.7k
R837 10k
R838 10k
AC1
ACCORD
R2361 220
Q2361
R2360 270
R2369 270
L2305
D2360
D2361
JS2321
JW
SP1
JK3004
L
R

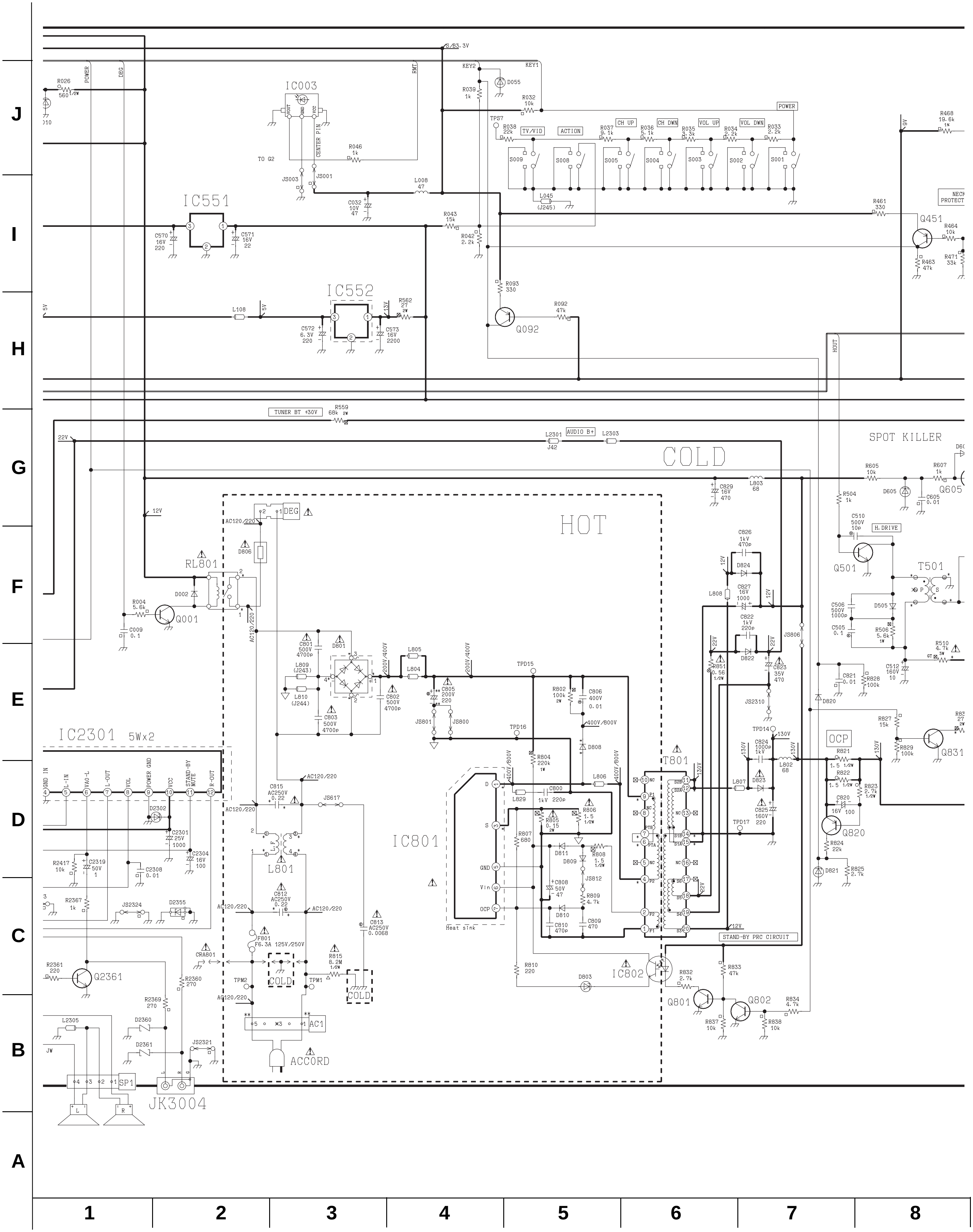

IC451
V-OUT
THERMAL PROTECTION
AMP
PUMP UP
Vref
Out
Vcc
Out
GND
POWER
CH DWN
VOL UP
VOL DWN
S004
S003
S002
S001
R035 3.3k
R034 2.2k
R033 2.2k
R468 19.6k 1%
JS454
R469 4.7k 1%
C458 50V 1
R457 1 1/2W
C454 35V 100
C459 35V 470
D451
JS460
C460 100V 0.22
R454 51k
R453 33k
R459 1.5k
JS452
JS451
C462 0.01
R465 1.2k
NECK PROTECTOR
R461 330
Q451
R462 2.7k
R464 10k
D452
C451 50V 2.2
R456 270 3W
C455 25V 1000
C452 16V 22
R471 33k
R463 47k
R451 1 1/2W
C461 100V 0.1
R452 2.7 1/2W
R458 12k
R455 18k
C403 16V 22
R412 470
R414 470
Q412
R411 6.8k
Q411
C411 0.068
R413 10k
HOUT
SPOTKILLER
VOUT
EHTIN
ACL
FBP
9V
60V
SPOT KILLER
COLD
TPA16
TPA17
TPA18
TPA19
DY
V.H1
V.L2
H.L4
H.H6
D606
C606 6.3V 220
R605 10k
R607 1k
Q605
D605
C605 0.01
R608 100k
Q606
R504 1k
C510 500V 10p
H.DRIVE
Q501
C829 16V 470
L803 68
C826 1kV 470p
D824
L808
C827 16V 1000
C822 1kV 220p
D822
C823 35V 470
R851 0.56 1/2W
JS806
JS2310
TPD14
C566 2kV 180p
T501
C565 2kV 680p
C564 1000p 2kV
C563 2kV 7500p
D558
D559
1200V
C506 500V 1000p
D505
C505 0.1
R506 5.6k 1W
JS553
Q551
H.OUT
L552
C569 200V 0.3
C575 500V 470p
L551
R561 1k 2W
JS570
C568 400V 0.033
0.18,0.22,0.27
R510 4.7k 3W
C512 160V 10
C821 0.01
R828 100k
D820
R509 10k 1%
R507 18k 1%
A12
HEATER GND
HEATER
220V
R827 15k
R830 27k 2W
R831 6.8k
Q830
R829 100k
Q831
OCP
130V
C824 1000p 1kV
L802 68
T801
L807
D823
C825 160V 220
TPD17
R821 1.5 1/2W
R822 1.5 1/2W
R823 2.7k 1/2W
C820 16V 100
Q820
R824 22k
D821
R825 2.7k
R817 6.8 3W
C828 160V 33
T551
EHT
VF
VS
JS556
R539 1M
R564 82k
R565 82k
D557
R558 22k
TPD1
R557 22k
D556
C560 100V 0.1
C561 50V 1
12V
STAND-BY PRC CIRCUIT
C557 500V 2200p
JS555
TPA14
D554
C555 250V 22
R551 0.47 1/2W
D551
TPD9
C554 500V 560p
C556 16V 470
R552 1.0 1/2W
D561
C562 500V 560p
TPD8
C551 35V 470
L245
26V
R833 47k
R832 2.7k
Q801
Q802
R834 4.7k
R837 10k
R838 10k
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8

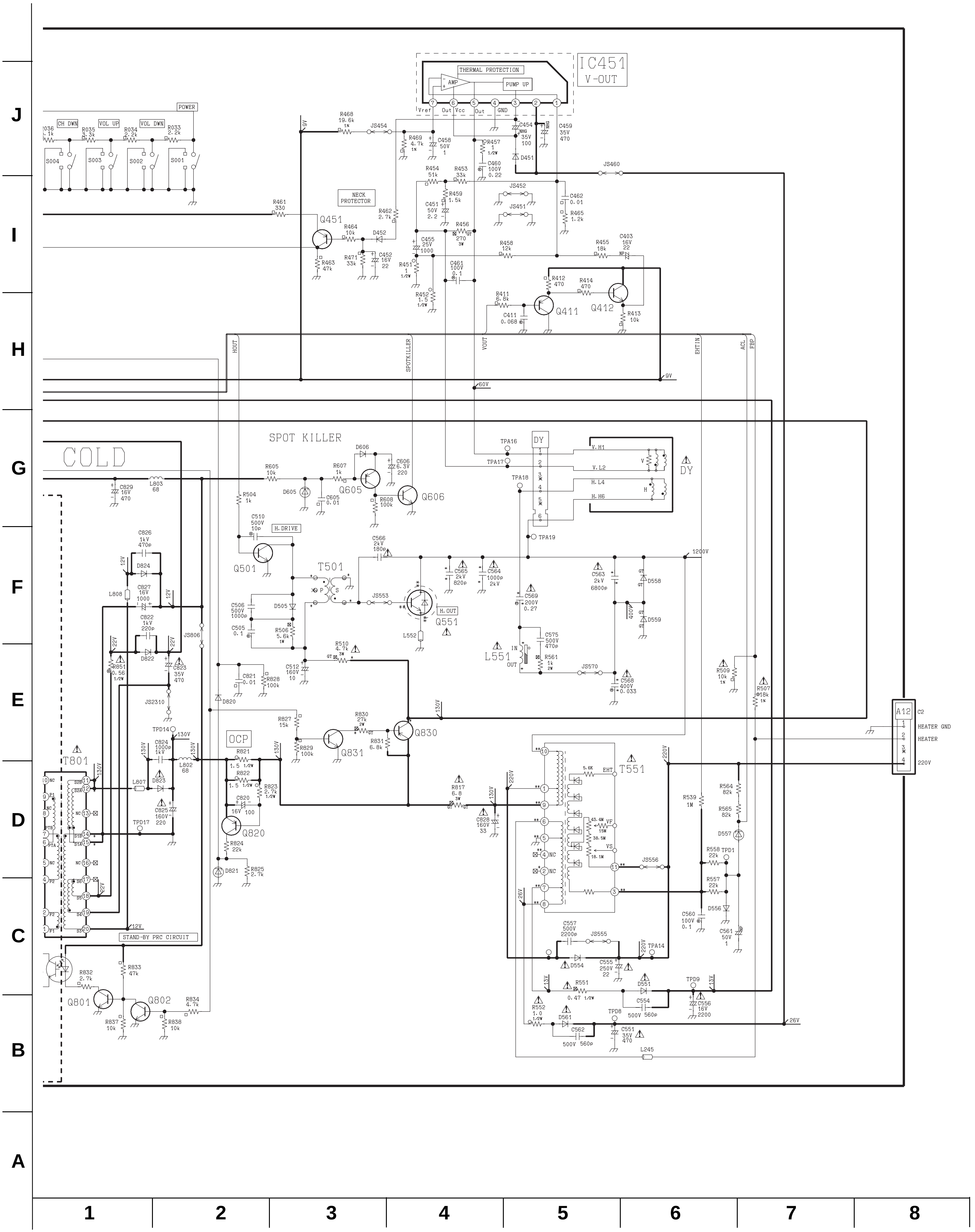

TNP2AH060CG
A
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
C1
A11
TP47R
TP47G
TP47B
R385
15
1/2W
9V
C359
16V
470
Q354
Q355
Q356
Q357
Q358
Q359
Q360
Q361
Q362
R380
1.5k
R381
1.5k
R382
1.5k
R374
1k
R375
1k
R376
1k
R377
330
R378
330
R379
330
R389
1k
R390
1k
R391
1k
R371
100
ROUT
R372
100
GOUT
R373
100
BOUT
R047
4.7k
R383
3.48k
R384
750
C360
50V
4.7
D380
D360
5V
L110
100
(J110)
R025
100
R024
100
L010
2.2
L012
2.2
SCL1
SDA1
C004
15p
C005
15p
TNR001
NC
AGC ADJ
+B
NC
NC
NC
(BT)
(RF-AGF)
(IF OUT)
SCL
SDA
AFT
AUDIO
NC (SIF-OUT)
BTL
AGC CONT
VIDEO
L015
3.3
C038
16V
47
C041
50V
2.2
JS200
TPA4
C012
16V
0.1
AFC1
D006
C003
50V
4.7
TPA5
R005
470
C035
12p
C034
39p
L014
18
R023
1k
FA1
R021
100
R022
100
FA1
RMT1
TP1
RMT
SDA2
SCL2
SDA1
SCL1
FA2
FA1
STBY12V
MTS
S-AGC
IC2201
AGC
AUXL1
AUXR1
OFFCAN1
OFFCAN2
WB TIME
VCC
WB DET
SPEC FILTR
SPEC TIME
SPEC DET
NOISE DET
AUXL2
AUXR2
(L1 for G model)
(R1 for G model)
R OUT
L OUT
PE
SDA
SCL
GND
PLL
PILOT DET
MPX IN
SAP DET
18mA
C2201
50V 4.7
R2201
220k
C3012
1 50V
C3018
1 50V
C2202
50V 2.2
C2203
50V 4.7
C2204
16V 10
C2205
50V 0.33
C2206
0.022
C2207
16V 3.3
C2208
16V
0.1
C2209
16V
0.1
TP43
TP4
C2214
10V
100
C2217
1000p
C2218
1000p
C3011
1
C3019
1
C2219
1
C2220
1
TPE10
TPE11
R2204
1k
R2203
1k
R2205
100
R2206
27k
C2216
10p
C2212
0.047
C2213
50V 0.47
TP49
C2210
16V 0.1
TP50
C2215
25V
10
R201
0
R202
2.2k
TPE1
R3132
22k
R3131
22k
R3134
33k
R3135
150k
R3133
15k
Q3194
Q3193
JS31
R3030
22k
R3031
22k
C3020
50V 1
C3017
50V 1
R3020
JW
JS3102
R3101
330k
R3104
330k
IC3101
L3 (A1 for Mono)
AUDIO SW
(FRONT or MONO)
L2
(TV for Mono)
R3
R
R2
C2501
3300p
C2503
0.033
C2505
25V 4.7
C2507
4700p
C2509
0.1
C2511
50V 1
C2512
0.1
C2513
50V 4.7
C2514
50V
4.7
C2532
50V 4.7
C2531
50V 4.7
C2502
3300p
C2504
0.033
C2506
25V 4.7
C2508
4700p
C2510
0.1
C2515
0.1
C2516
4.7
50V
C2517
4.7 50V
C2518
50V 4.7
C2519
16V
47
C2520
50V
0.01
D2501
R2505
100
R2504
100
R_IN
BBE1R
BBE2R
BBEOUTR
TONE INR
TONE HR
TONE LR
ROUT
AGC
SS FIL
CVB
CVA
SDA
SCL
GND
L_IN
BBE1L
BBE2L
BBEOUTL
TONE INL
TONE HL
TONE LL
LOUT
SR FIL
VREF
CTH
CTL
AUX0
AUX1
VCC
IC2501


J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
IC001
AMCV8
COMB/SyncSepa/RGB/DEF/DET
Digital_1chip_on_farmware
IC004
Q354
Q355
Q356
Q357
Q358
Q359
Q360
Q361
Q362
ROUT
GOUT
BOUT
A11
TP47R
TP47G
TP47B
D360
D380
MTS
S-AGC
IC2201
IC2501
IC3101
AUDIO SW
(FRONT or MONO)
Q3193
Q3194
IC3001
VIDEO SW
Q070
Q057
JK3003
VIDEO2
JK3001
REAR AV
COMPONENT:OPEN
COMPOSIT:CLOSE
X001
D003
(J202)
L003
L004
L005
D007
9V
3.3V

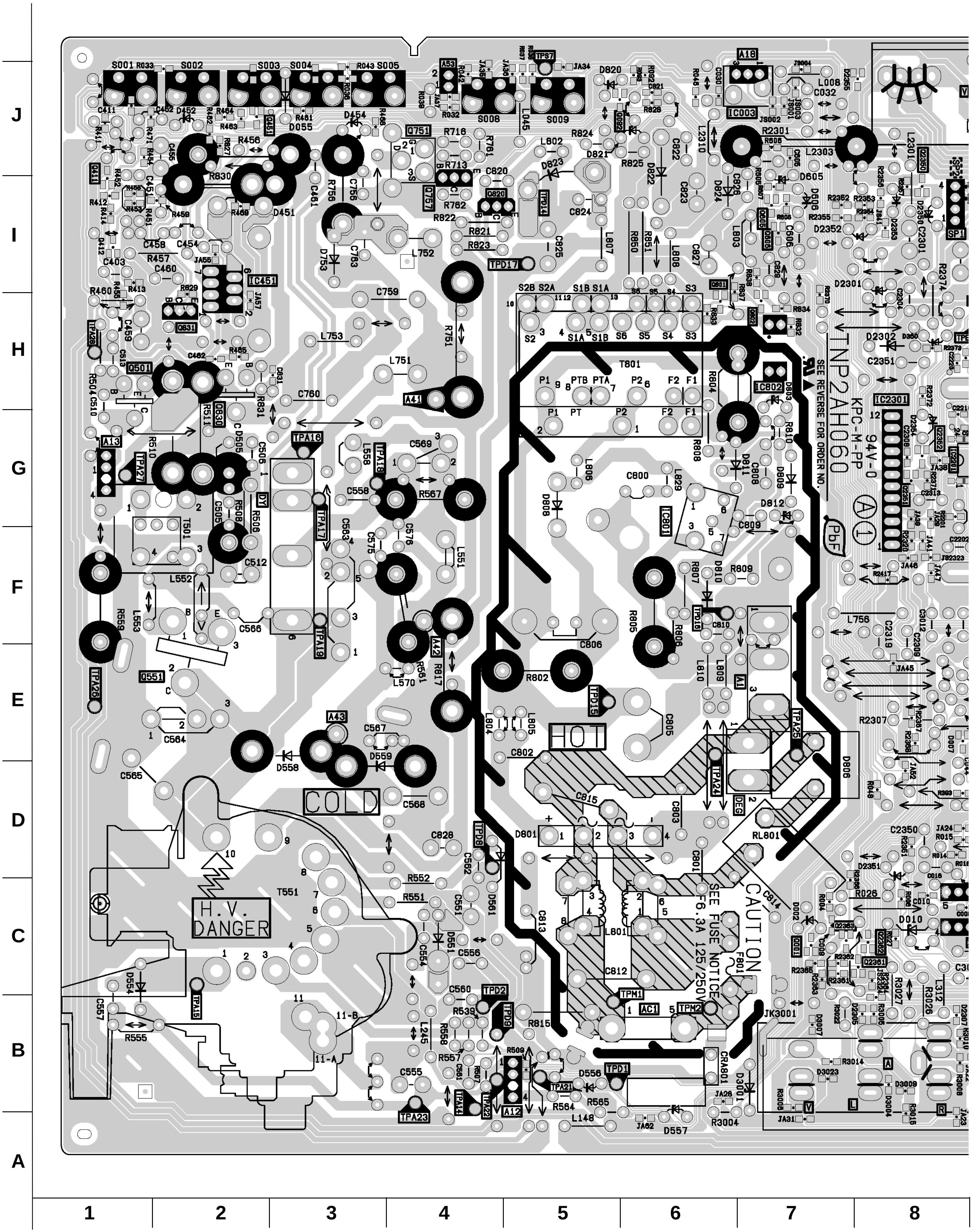

IC005
STANDBY 5V
STANDBY 3.3V
IC003
IC551
IC002
16K
I²C
EEPROM
IC501
Q560
Q2351
Q2352
IC55
RL801
Q001
DEG
D806
D002
T3001
IC3002
Front Video SW
Q057
Q058
Q3001
Q3002
IC2301 5Wx2
VAO-R
R-IN
RF
GND IN
L-IN
VAO-L
L-OUT
VOL
POWER GND
VCC
STAND-BY MUTE
R-OUT
Q2363
Q2362
Q2361
L801
F801 F6.3A 125V/250V
COLD
AC1
ACCORD
SP1
JK3001
REAR AV
JK3002
FRONT AV
JK3004
TUNER BT +30V
S/B3.3V
S/B5V
POWER
DEG
HOUT
FBP
EHTIN
ACL
SPOTKILLER
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8

A-BOARD 3/5 TNP2AH060CG CT-20SL14TJ

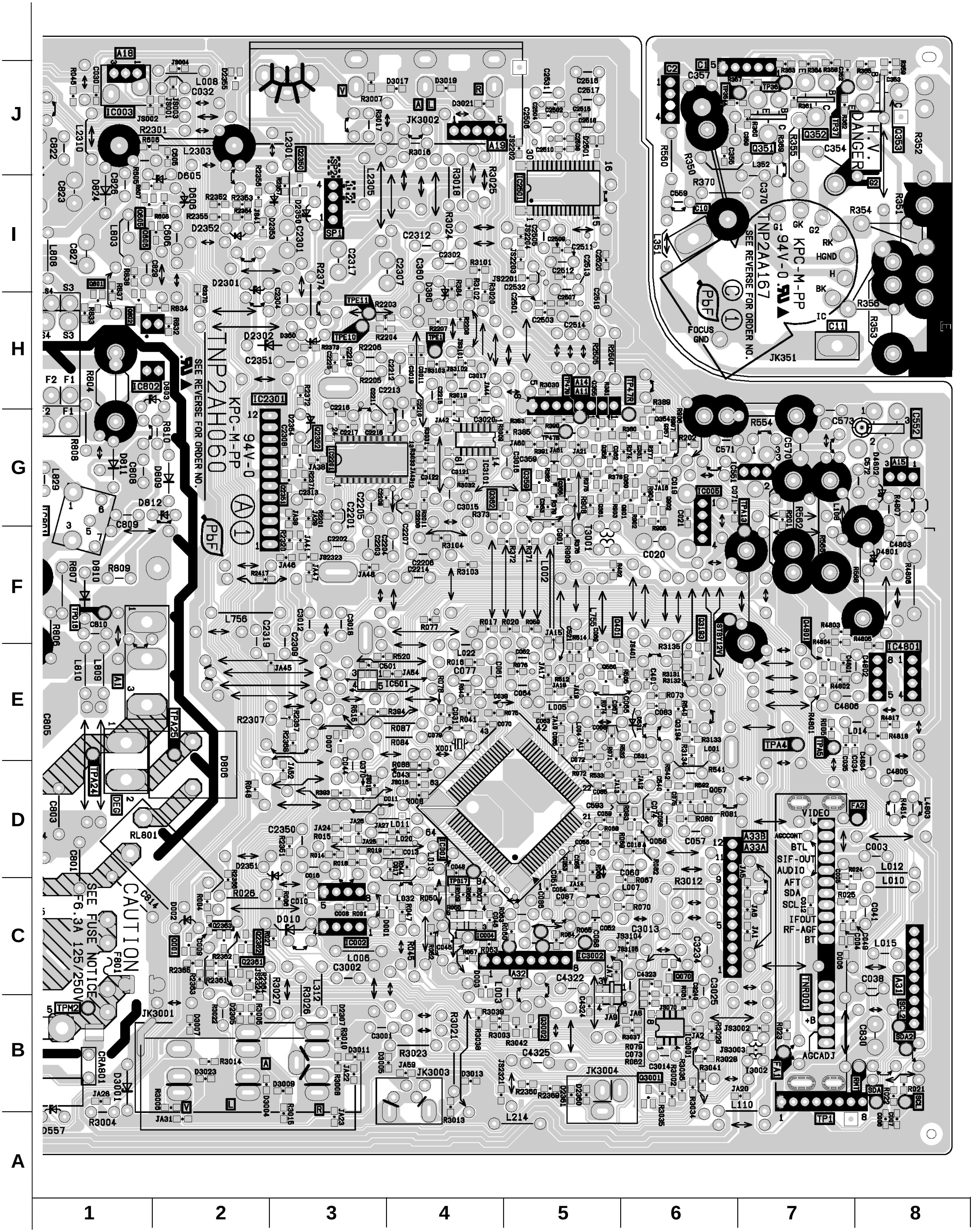

J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
S/B3.3V
KEY2
KEY1
POWER
DEG
RMT
R026 560 1/2W
IC003
TO G2
CENTER PIN
JS003
JS001
R046 1k
D055
R039 1k
R032 10k
TPS7
R038 22k
TV/VID
ACTION
CH UP
CH DWN
VOL UP
VOL DWN
R037 9.1k
R036 5.1k
R035 3.3k
R034 2.2k
R033 2.2k
S009
S008
S005
S004
S003
S002
S001
L045 (J245)
L008 47
C032 10V 47
IC551
C570 16V 220
C571 16V 22
R043 15k
R042 2.2k
R461 330
Q451
R464 10k
R463 47k
R471 33k
R468 19.6k 1%
9V
NECK PROTECT
R093 330
Q092
R092 47k
IC552
L108
5V
13V
R562 27 2W
C572 6.3V 220
C573 16V 2200
HOUT
TUNER BT +30V
R559 68k 2W
22V
L2301 J42
AUDIO B+
L2303
COLD
SPOT KILLER
R605 10k
R607 1k
D605
C605 0.01
Q605
R504 1k
C829 16V 470
L803 68
12V
HOT
DEG
AC120/220
D806
RL801
D002
R004 5.6k
Q001
C009 0.1
C510 500V 10p
H.DRIVE
Q501
T501
C826 1kV 470p
D824
L808
C827 16V 1000
C822 1kV 220p
D822
C506 500V 1000p
D505
C505 0.1
R506 5.6k 1W
R510 4.7k 3W
C512 160V 10
C821 0.01
R828 100k
JS806
R851 0.56 1/2W
C823 35V 470
D820
C801 500V 4700p
D801
L805
L804
200V/400V
TPD15
L809 (J243)
L810 (J244)
C802 500V 4700p
C803 500V 4700p
C805 200V 220
JS801
JS800
R802 100k 2W
C806 400V 0.01
400V/800V
D808
TPD16
R804 220k 1W
JS2310
TPD14
130V
C824 1000p 1kV
L802 68
OCP
R827 15k
R829 100k
Q831
R821 1.5 1/2W
R822 1.5 1/2W
R823 2.7k 1/2W
C820 16V 100
Q820
R824 22k
R825 2.7k
D821
IC2301 5Wx2
GND IN
L-IN
VAO-L
L-OUT
VOL
POWER GND
VCC
STAND-BY MUTE
R-OUT
D2302
C2301 25V 1000
C2304 16V 100
R2417 10k
C2319 50V 1
C2308 0.01
R2367 1k
JS2324
D2355
C815 AC250V 0.22
JS617
L801
L.F
C812 AC250V 0.22
C813 AC250V 0.0068
F801 F6.3A 125V/250V
R815 8.2M 1/2W
TPM2
TPM1
CRA801
AC1
ACCORD
IC801
D
S
GND
Vin
OCP
Heat sink
L829
C800 1kV 220p
L806
R806 1.5 1/2W
R805 0.15 2W
R807 680
D811
D809
R808 1.5 1/2W
JS812
C808 50V 47
R809 4.7k
D810
C810 470p
C809 470
T801
L807
D823
C825 160V 220
TPD17
STAND-BY PRC CIRCUIT
R810 220
D803
IC802
R832 2.7k
R833 47k
Q801
Q802
R834 4.7k
R837 10k
R838 10k
R2361 220
Q2361
R2360 270
R2369 270
L2305
D2360
D2361
JS2321
JW
SP1
JK3004
L
R


IC451
V-OUT
THERMAL PROTECTION
AMP
PUMP UP
Vref
Out
Vcc
Out
GND
POWER
CH DWN
VOL UP
VOL DWN
S004
S003
S002
S001
R035 3.3k
R034 2.2k
R033 2.2k
R468 19.6k 1%
JS454
9V
R469 4.7k 1%
C458 50V 1
R457 1 1/2W
C454 NHG 35V 100
C459 35V 470
D451
C460 100V 0.22
JS460
R461 330
NECK PROTECTOR
R462 2.7k
R454 51k
R453 33k
R459 1.5k
JS452
JS451
C462 0.01
R465 1.2k
Q451
R464 10k
D452
C451 50V 2.2
R456 270 3W
R463 47k
R471 33k
C452 16V 22
C455 25V 1000
R451 1 1/2W
C461 100V 0.1
R452 1.5 1/2W
R458 12k
R455 18k
C403 16V 22
R412 470
R414 470
R411 6.8k
C411 0.068
Q411
Q412
R413 10k
HOUT
SPOTKILLER
VOUT
EHTIN
ACL
FBP
9V
60V
SPOT KILLER
COLD
D606
R605 10k
R607 1k
C606 6.3V 220
D605
C605 0.01
Q605
R608 100k
Q606
R504 1k
C829 16V 470
L803 68
TPA16
TPA17
TPA18
DY
V.H1
V.L2
H.L4
H.H6
TPA19
C510 500V 10p
H.DRIVE
Q501
T501
C826 1kV 470p
D824
C566 2kV 180p
C565 2kV 820p
C564 1000p 2kV
C563 2kV 6800p
1200V
D558
L808
C827 16V 1000
C506 500V 1000p
D505
JS553
H.OUT
Q551
C569 200V 0.27
D559
C505 0.1
R506 5.6k 1W
L552
C575 500V 470p
JS806
C822 1kV 220p
D822
R510 4.7k 3W
L551
R561 1k 2W
JS570
R851 0.56 1/2W
C823 35V 470
C821 0.01
C512 160V 10
R828 100k
C568 400V 0.033
R509 10k 1%
R507 18k 1%
JS2310
D820
R827 15k
R830 27k 2W
130V
A12
C2
HEATER GND
HEATER
220V
TPD14
C824 1000p 1kV
L802 68
OCP
R829 100k
Q831
R831 6.8k
Q830
T801
R821 1.5 1/2W
R822 1.5 1/2W
R823 2.7k 1/2W
C820 16V 100
L807
D823
C825 160V 220
TPD17
Q820
R817 6.8 3W
C828 160V 33
T551
EHT
VF
VS
R539 1M
R564 82k
R565 82k
D557
R558 22k
TPD1
R557 22k
D556
C560 100V 0.1
C561 50V 1
JS556
R824 22k
D821
R825 2.7k
STAND-BY PRC CIRCUIT
12V
C557 500V 2200p
JS555
TPA14
D554
C555 250V 22
R832 2.7k
R833 47k
Q801
Q802
R834 4.7k
R837 10k
R838 10k
R551 0.47 1/2W
D551
TPD9
C554 500V 560p
C556 16V 2200
R552 1.0 1/2W
D561
C562 500V 560p
TPD8
C551 35V 470
26V
L245
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8

A-BOARD 5/5 TNP2AH060CG CT-20SL14TJ

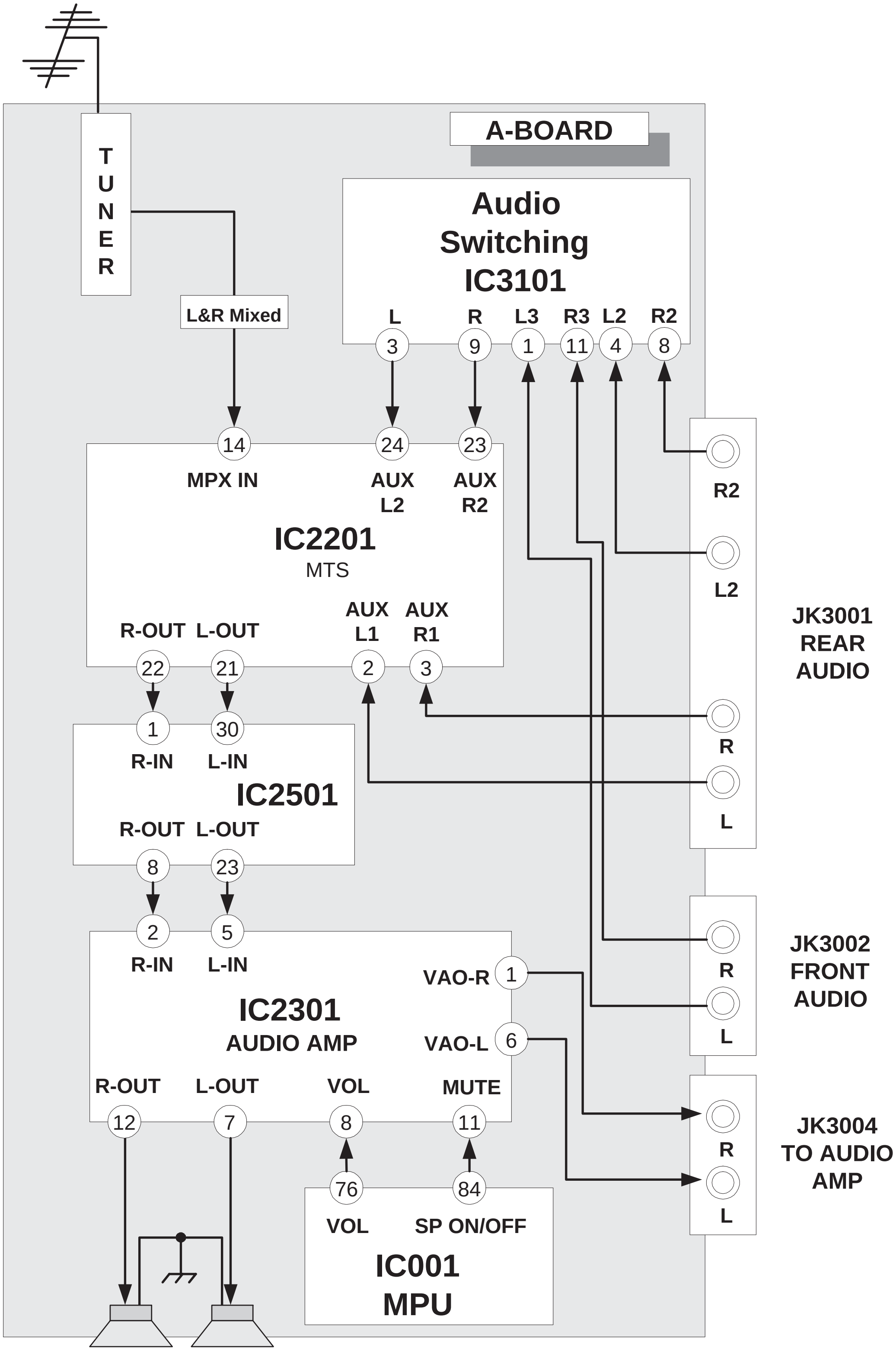

HOT
COLD
H.V. DANGER
SEE FUSE NOTICE
F6.3A 125/250V
CAUTION
SEE REVERSE FOR ORDER NO.
TNP2AH060
KPC-M-PP
94V-0
PbF
T801
T551
T501
IC801
IC802
IC451
IC003
IC2301
D801
RL801
JK3001
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8

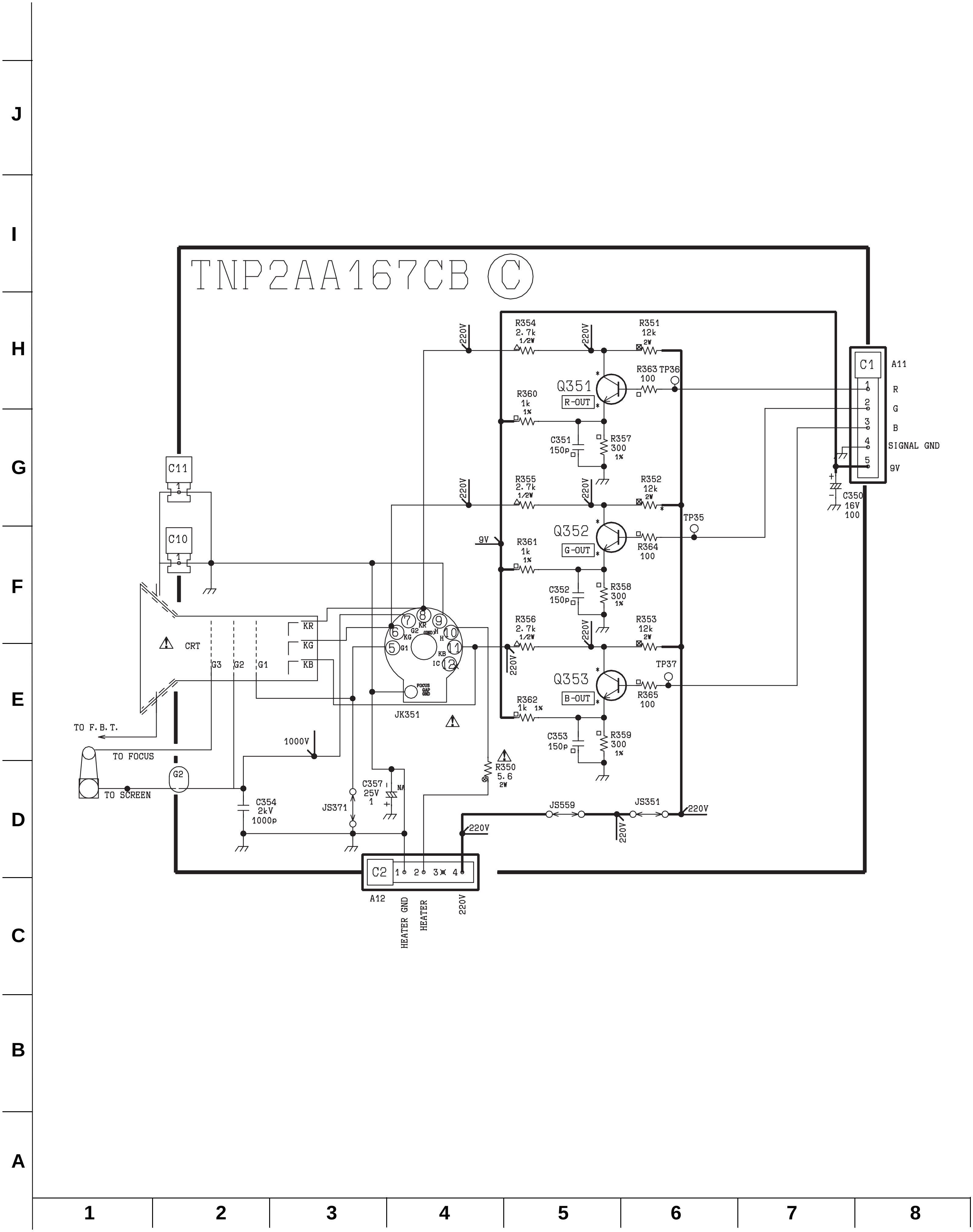
A-BOARD 1/2 TNP2AH060 CT-20SL14J, CT-20SL14TJ

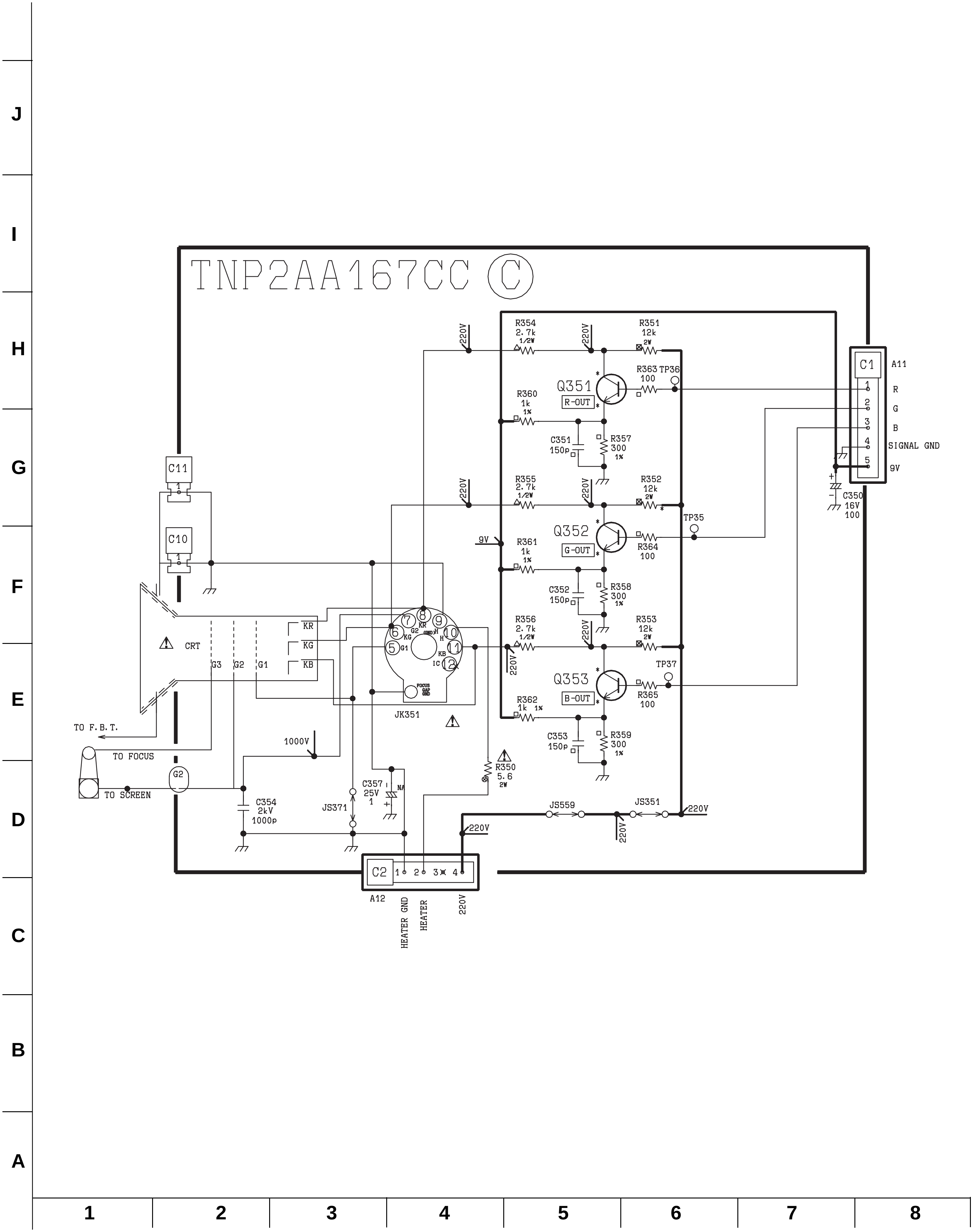

J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
TNP2AH060
KPC-M-PP
94V-0
SEE REVERSE FOR ORDER NO.
PbF
A 1
TNP2AA167
KPC-M-PP
94V-0
SEE REVERSE FOR ORDER NO.
C 1
H.V. DANGER
G1
GK
G2
RK
HGND
H
BK
IC
FOCUS
GND
JK351
CAUTION
SEE FUSE NOTICE
F6.3A 125/250V
VIDEO
AGCCONT
BTL
SIF-OUT
AUDIO
AFT
SDA
SCL
IFOUT
RF-AGF
BT
+B
AGCADJ
TNR001
IC2301
IC2501
IC3101
IC501
IC001
IC002
IC003
IC005
IC802
IC4801
IC3002
IC004
JK3001
JK3002
JK3003
JK3004
RL801
STBY12V
TPA4
TPA5
TPA13
TPA24
TPA25
TPM2
TP1
FA1
FA2
A1
A11
A14
A15
A18
A19
A31
A32
A33A
A33B
SP1
DEG
L
R
V

A-BOARD & C-BOARD 2/2 TNP2AH060 CT-20SL14J, CT-20SL14TJ

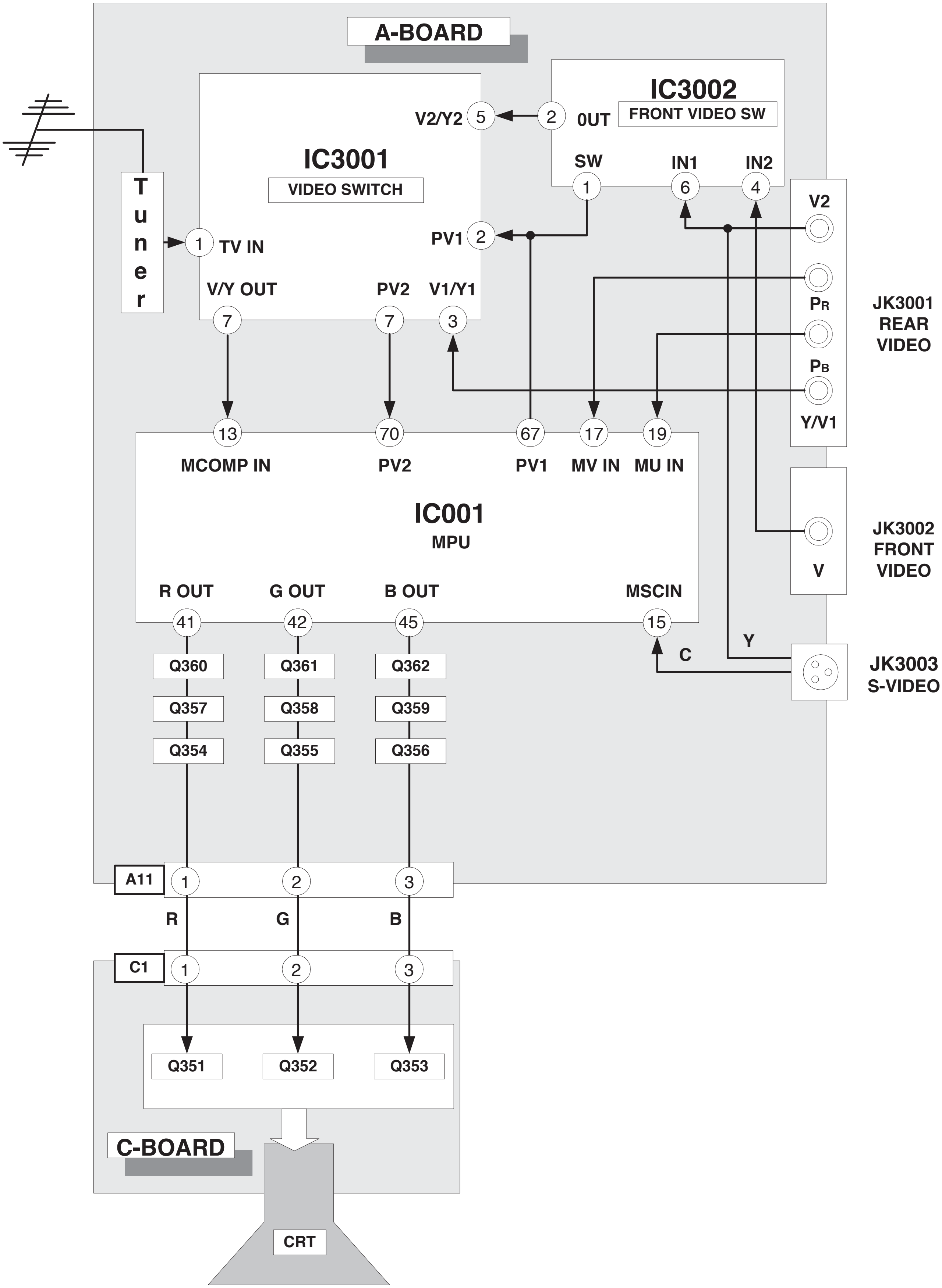
Audio signal path block diagram


A-BOARD
TUNER
L&R Mixed
Audio Switching IC3101
L 3
R 9
L3 1
R3 11
L2 4
R2 8
14 MPX IN
24 AUX L2
23 AUX R2
IC2201
MTS
R-OUT L-OUT
AUX L1
AUX R1
22
21
2
3
R2
L2
JK3001 REAR AUDIO
R
L
1 R-IN
30 L-IN
IC2501
R-OUT L-OUT
8
23
2 R-IN
5 L-IN
IC2301
AUDIO AMP
VAO-R 1
VAO-L 6
R-OUT 12
L-OUT 7
VOL 8
MUTE 11
JK3002 FRONT AUDIO
R
L
JK3004 TO AUDIO AMP
R
L
76 VOL
84 SP ON/OFF
IC001
MPU


TNP2AA167CB Ⓒ
R354 2.7k 1/2W
R351 12k 2W
R355 2.7k 1/2W
R352 12k 2W
R356 2.7k 1/2W
R353 12k 2W
R360 1k 1%
R361 1k 1%
R362 1k 1%
R363 100
R364 100
R365 100
R357 300 1%
R358 300 1%
R359 300 1%
C351 150p
C352 150p
C353 150p
Q351 R-OUT
Q352 G-OUT
Q353 B-OUT
TP35
TP36
TP37
220V
9V
1000V
C1 A11
1 R
2 G
3 B
4 SIGNAL GND
5 9V
C350 16V 100
C11
C10
CRT
KR
KG
KB
G3
G2
G1
JK351
FOCUS GAP GND
TO F.B.T.
TO FOCUS
TO SCREEN
G2
C354 2kV 1000p
C357 25V 1
NA
JS371
R350 5.6 2W
JS559
JS351
C2 A12
1 2 3 4
HEATER GND
HEATER
220V
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8


J
I
H
G
F
E
D
C
B
A
TNP2AA167CC Ⓒ
R354 2.7k 1/2W
220V
R351 12k 2W
C1
A11
Q351
R-OUT
R363 100
TP36
1 R
2 G
3 B
4 SIGNAL GND
5 9V
R360 1k 1%
C351 150p
R357 300 1%
C11
C10
R355 2.7k 1/2W
R352 12k 2W
C350 16V 100
Q352
G-OUT
TP35
9V
R361 1k 1%
R364 100
C352 150p
R358 300 1%
R356 2.7k 1/2W
R353 12k 2W
KR
KG
KB
G2
H
(GND)
G1
IC
FOCUS GAP GND
CRT
G3
G2
G1
TP37
Q353
B-OUT
R365 100
R362 1k 1%
JK351
C353 150p
R359 300 1%
TO F.B.T.
TO FOCUS
1000V
R350 5.6 2W
C357 25V 1
NA
TO SCREEN
C354 2kV 1000p
JS371
JS559
JS351
C2
A12
HEATER GND
HEATER
1
2
3
4
5
6
7
8

Video signal path block diagram



A-BOARD
IC3002
FRONT VIDEO SW
2
0UT
SW
1
IN1
6
IN2
4
IC3001
VIDEO SWITCH
V2/Y2
5
PV1
2
1
TV IN
T u n e r
V/Y OUT
7
PV2
7
V1/Y1
3
V2
PR
PB
Y/V1
JK3001 REAR VIDEO
V
JK3002 FRONT VIDEO
Y
C
JK3003 S-VIDEO
13
MCOMP IN
70
PV2
67
PV1
17
MV IN
19
MU IN
IC001
MPU
R OUT
41
G OUT
42
B OUT
45
MSCIN
15
Q360
Q357
Q354
Q361
Q358
Q355
Q362
Q359
Q356
A11
1
2
3
R
G
B
C1
1
2
3
Q351
Q352
Q353
C-BOARD
CRT

A - BOARD - TNP2AH060CD/CG

IC001			
1	0.00	43	2.50
2	0.00	44	1.70
3	0.00	45	0.00
4	0.00	46	0.00
5	0.00	47	3.30
6	1.20	48	1.90
7	1.20	49	1.90
8	1.30	50	1.60
9	3.30	51	1.70
10	0.00	52	3.30
11	2.70	53	1.70
12	1.50	54	1.40
13	1.40	55	3.30
14	0.40	56	1.40
15	1.60	57	0.00
16	2.20	58	0.00
17	1.70	59	3.30
18	1.70	60	3.30
19	1.40	61	3.30
20	1.40	62	0.70
21	1.00	63	3.30
22	2.60	64	3.30
23	0.00	65	3.40
24	1.90	66	3.50
25	1.90	67	0.10
26	1.40	68	3.20
27	1.28	69	0.00
28	0.00	70	0.00
29	1.30	71	0.00
30	1.80	72	5.20
31	1.00	73	5.20
32	3.30	74	0.00
33	1.70	75	0.00
34	0.80	76	0.00
35	0.00	77	3.30
36	0.60	78	0.00
37	3.30	79	0.00
38	3.30	80	3.30
39	2.30	81	5.20
40	1.70	82	3.30
41	0.40	83	0.00
42	0.40	84	3.30

IC002	
1	0.00
2	0.00
3	0.00
4	0.00
5	3.40
6	3.40
7	5.20
8	5.20

IC003	
1	0.00
2	3.31
3	3.27

IC004	
1	0.00
2	0.00
3	0.00
4	3.30
5	3.30

IC005	
1	9.10
2	3.30
3	0.00
4	9.10

IC451	
1	2.00
2	27.80
3	1.20
4	0.00
5	17.60
6	27.90
7	2.00

IC501	
1	0.00
2	1.35
3	0.00
4	1.05
5	3.30

IC551	
1	12.20
2	0.00
3	9.00

IC552	
1	7.50
2	0.00
3	5.00

IC801↓	
1	-21.00
2	N/C
3	0.10
4	N/C
5	GND
6	32.24
7	1.50

IC802↓	
1	2.30
2	32.24

IC2201			
1	1.60	13	2.80
2	2.20	14	2.20
3	2.20	15	2.50
4	2.30	16	3.50
5	2.40	17	0.00
6	0.07	18	3.20
7	5.00	19	3.40
8	2.50	20	0.00
9	2.60	21	2.20
10	0.80	22	2.20
11	2.30	23	2.20
12	2.50	24	2.20

IC2501			
1	4.40	16	8.90
2	0.00	17	0.00
3	0.00	18	0.00
4	4.50	19	3.80
5	4.50	20	3.80
6	4.50	21	4.40
7	4.50	22	4.80
8	4.50	23	4.40
9	1.00	24	4.50
10	4.50	25	4.60
11	3.60	26	4.50
12	3.60	27	4.50
13	2.90	28	0.00
14	3.20	29	0.00
15	0.00	30	4.40

IC3001	
1	4.10
2	0.20
3	4.10
4	0.00
5	4.10
6	9.00
7	4.30
8	0.00

IC3002	
1	0.20
2	4.40
3	8.90
4	5.10
5	0.00
6	5.10

IC2301	
1	7.50
2	5.60
3	21.00
4	0.00
5	5.60
6	7.50
7	10.60
8	1.30
9	0.00
10	22.70
11	3.20
12	10.20

IC3101	
1	0.10
2	4.40
3	4.40
4	4.40
5	7.80
6	7.80
7	0.00
8	4.40
9	4.40
10	4.40
11	0.00
12	0.00
13	0.00
14	8.90

A - BOARD - TNP2AH60CD/CG

	Q001	Q057	Q058	Q070	Q092	Q2350	Q2361	Q2362	Q2363
B	0.00	1.50	1.50	4.12	8.90	5.35	0.30	0.00	1.34
C	13.00	0.00	0.00	8.90	1.40	0.00	0.00	0.10	0.00
E	0.00	0.07	0.07	3.50	3.30	3.14	0.00	0.00	1.50

	Q3001	Q3002	Q3193	Q3194	Q354	Q355	Q356	Q357	Q358
B	1.30	1.30	0.60	0.05	4.50	4.30	4.40	2.60	2.60
C	3.30	3.30	0.03	7.80	8.50	8.40	8.40	4.50	4.30
E	0.70	0.70	0.00	0.00	3.80	3.60	3.70	2.00	2.00

	Q359	Q360	Q361	Q362	Q411	Q412	Q451	Q501	Q551
B	2.60	0.50	0.40	0.40	2.25	2.90	5.10	0.40	0.00
C	4.40	0.00	0.00	0.00	0.00	9.00	1.40	56.80	14.70
E	2.00	1.10	1.10	1.10	2.90	2.40	3.30	0.00	0.00

	Q560	Q605	Q606	Q801	Q802	Q820	Q830	Q831
B	0.30	4.80	0.00	0.00	0.70	130.40	129.80	0.60
C	0.00	0.00	3.30	12.52	0.00	0.00	130.40	0.20
E	0.60	4.70	0.00	0.00	0.00	130.80	130.50	0.00

	*Q751
G	7.50
D	8.90
S	0.00

	*Q757
B	0.00
C	7.60
E	0.00

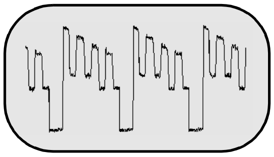
	*Q901	*Q902
B	1.00	5.20
C	5.20	2.40
E	0.40	5.80

***For models (CT-24SL13 and CT-24SL13UG) only.**

C - BOARD - TNP2AA167CB/CC

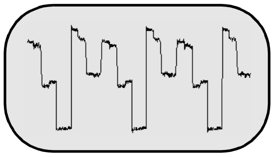
	Q351	Q352	Q353
B	1.90	1.50	6.30
C	8.90	5.70	8.90
E	1.50	1.50	5.70

A-Board



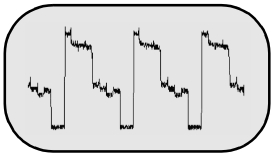
① **4.6 Vp-p**

A11 PIN 5 (BLUE OUT)



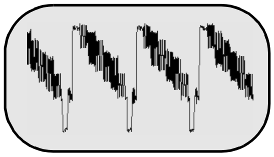
② **4.6 Vp-p**

A11 PIN 3 (RED OUT)



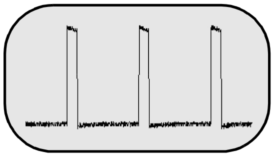
③ **4.6 V-p**

A11 PIN 4 (GREEN OUT)



④ **1.3 Vp-p**

TPA5 (VIDEO)



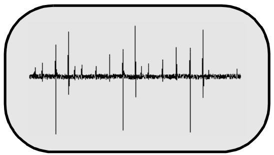
⑤ **3.40 Vp-p**

IC001 PIN 36 (FBP IN)

10MHz X'tal

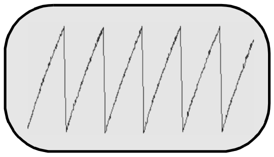
⑥

IC001 PIN 50 (OSC)



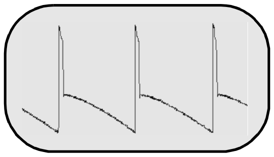
⑦ **800mv Vp-p**

IC451 PIN 1 (VERT IN)



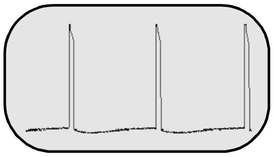
⑧ **3.88 Vp-p**

Q4111 B (V DRIVE)



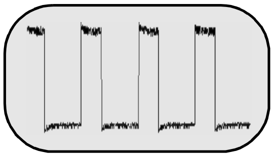
⑨ **56.8 Vp-p**

IC451 PIN 5(V OUT)



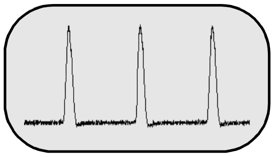
⑩ **31.4 Vp-p**

IC451 PIN 3 (PUMP UP)



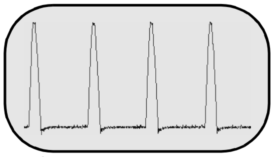
⑪ **3.20 Vp-p**

IC501 PIN 4 (H-DRIVE)



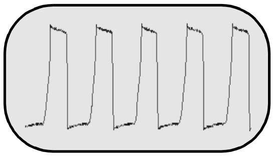
⑫ **26 Vp-p**

A12 PIN 2 (HEATER)



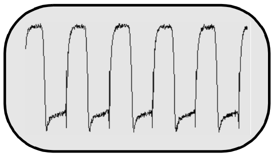
⑬ **1.24 kVp-p**

Q551 Collector (H OUT)



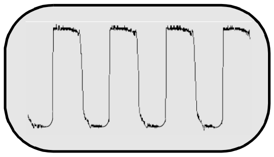
⑭ **392 Vp-p**

IC801 PIN 1



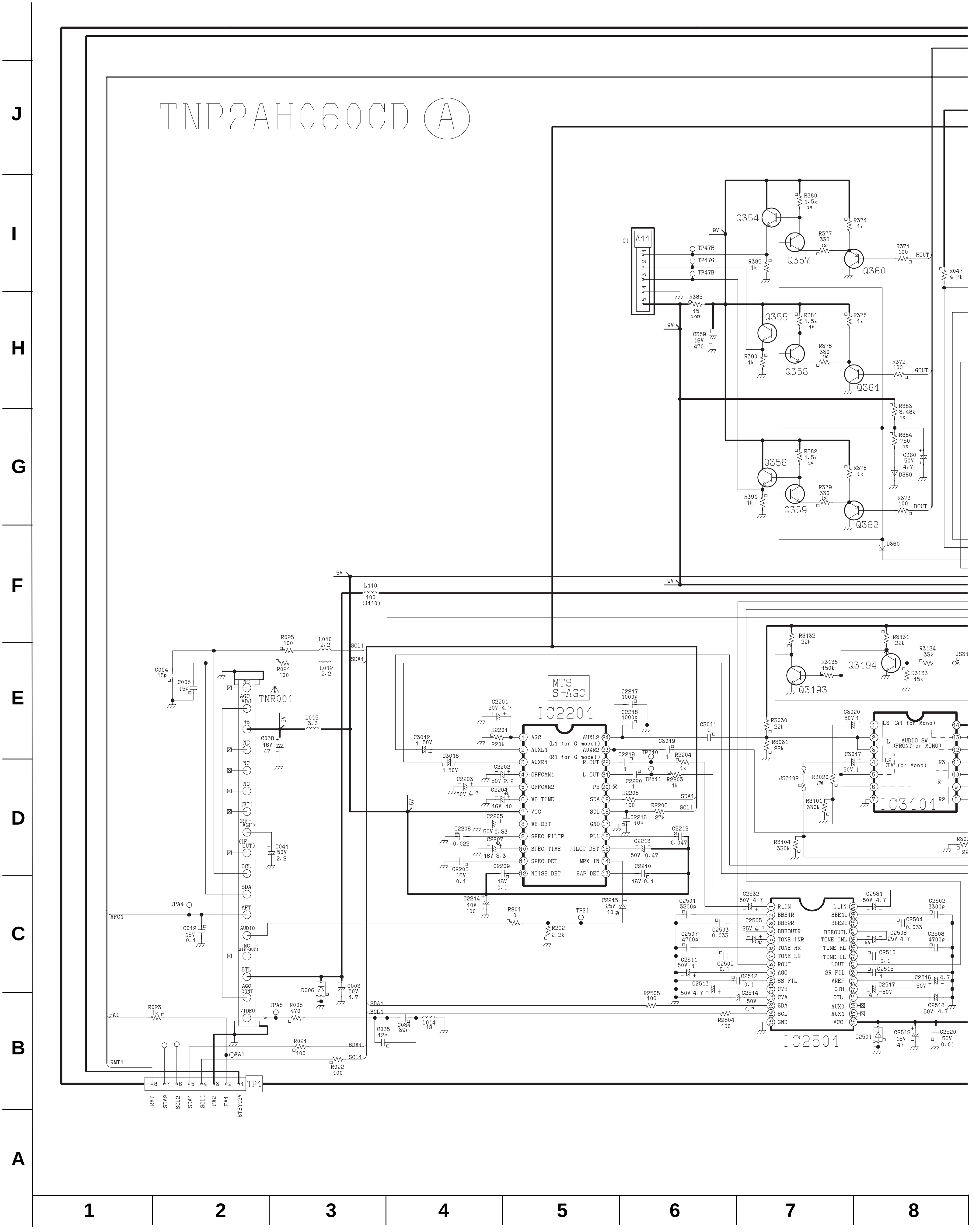
⑮ **2.88 Vp-p**

IC801 PIN 7

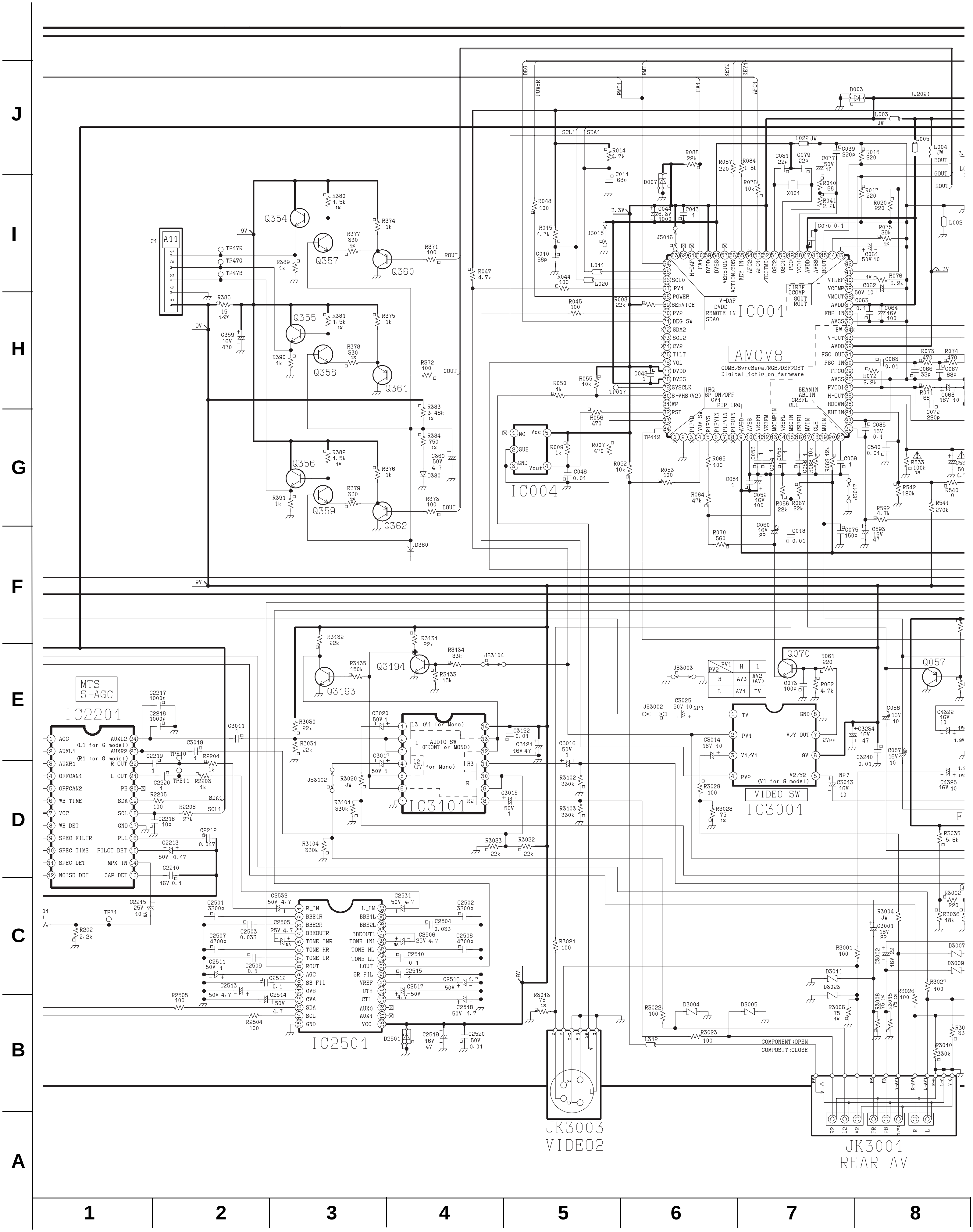


⑯ **114 Vp-p**

Q501 Collector


TNP2AH060CD A
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
C1
A11
TP47R
TP47G
TP47B
R385 15 1/2W
C359 16V 470
9V
Q354
Q355
Q356
Q357
Q358
Q359
Q360
Q361
Q362
R380 1.5k 1%
R381 1.5k 1%
R382 1.5k 1%
R374 1k
R375 1k
R376 1k
R377 330 1%
R378 330 1%
R379 330 1%
R371 100
R372 100
R373 100
ROUT
GOUT
BOUT
R389 1k
R390 1k
R391 1k
R383 3.48k 1%
R384 750 1%
C360 50V 4.7
D380
D360
R047 4.7k
5V
L110 100 (J110)
R025 100
R024 100
L010 2.2
L012 2.2
SCL1
SDA1
C004 15p
C005 15p
TNR001
NC
AGC ADJ
+B
(BT)
(RF-AGF)
(IF OUT)
SCL
SDA
AFT
AUDIO
NC (SIF-OUT)
BTL
AGC CONT
VIDEO
L015 3.3
C038 16V 47
C041 50V 2.2
TPA4
AFC1
C012 16V 0.1
D006
C003 50V 4.7
FA1
R023 1k
TPA5
R005 470
C035 12p
C034 39p
L014 18
R021 100
R022 100
RMT1
FA1
TP1
RMT
SDA2
SCL2
SDA1
SCL1
FA2
FA1
STBY12V
MTS S-AGC
IC2201
AGC
AUXL1
AUXR1
OFFCAN1
OFFCAN2
WB TIME
VCC
WB DET
SPEC FILTR
SPEC TIME
SPEC DET
NOISE DET
AUXL2
AUXR2
(L1 for G model)
(R1 for G model)
R OUT
L OUT
PE
SDA
SCL
GND
PLL
PILOT DET
MPX IN
SAP DET
C2201 50V 4.7
R2201 220k
C3012 1 50V
C3018 1 50V
C2202 50V 2.2
C2203 50V 4.7
C2204 16V 10
C2205 50V 0.33
C2206 0.022
C2207 16V 3.3
C2208 16V 0.1
C2209 16V 0.1
C2214 10V 100
C2215 25V 10
C2217 1000p
C2218 1000p
C2219 1
C2220 1
TPE10
TPE11
R2204 1k
R2203 1k
R2205 100
R2206 27k
C2216 10p
C2212 0.047
C2213 50V 0.47
C2210 16V 0.1
C3011 1
C3019 1
R201 0
R202 2.2k
TPE1
R3132 22k
R3131 22k
R3134 33k
R3133 15k
R3135 150k
Q3193
Q3194
JS31
R3030 22k
R3031 22k
C3020 50V 1
C3017 50V 1
JS3102
R3020 JW
R3101 330k
R3104 330k
IC3101
L3 (A1 for Mono)
AUDIO SW (FRONT or MONO)
L2 (TV for Mono)
R3
R2
IC2501
R_IN
BBE1R
BBE2R
BBEOUTR
TONE INR
TONE HR
TONE LR
ROUT
AGC
SS FIL
CVB
CVA
SDA
SCL
GND
L_IN
BBE1L
BBE2L
BBEOUTL
TONE INL
TONE HL
TONE LL
LOUT
SR FIL
VREF
CTH
CTL
AUX0
AUX1
VCC
C2532 50V 4.7
C2531 50V 4.7
C2501 3300p
C2502 3300p
C2503 0.033
C2504 0.033
C2505 25V 4.7
C2506 25V 4.7
C2507 4700p
C2508 4700p
C2509 0.1
C2510 0.1
C2511 50V 1
C2512 0.1
C2513 50V 4.7
C2514 50V 4.7
C2515 1
C2516 4.7 50V
C2517 50V
C2518 50V 4.7
C2519 16V 47
C2520 50V 0.01
D2501
R2505 100
R2504 100

A-BOARD 1/5 TNP2AH060CD CT-20SL14J


J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
IC001
AMCV8
COMB/SyncSepa/RGB/DEF/DET
Digital_1chip_on_farmware
IC004
IC2201
MTS
S-AGC
IC3101
AUDIO SW
(FRONT or MONO)
IC3001
VIDEO SW
IC2501
JK3003
VIDEO2
JK3001
REAR AV
Q354
Q355
Q356
Q357
Q358
Q359
Q360
Q361
Q362
Q3193
Q3194
Q070
Q057
X001
D003
D007
D360
D380
D2501
A11
TP47R
TP47G
TP47B
ROUT
GOUT
BOUT
9V
3.3V
(J202)
COMPONENT:OPEN
COMPOSIT:CLOSE

MTNC030834A1
B01/B05

Service Manual

Color Television

Simplified

CT-20SL13G / CT-24SL13G / CT-24SL13UG
NA10

This simplified service manual is issued to add listed models to the main service manual order No. MTNC030623C1(CT-25L8G). A complete parts list and schematics are included in this simplified service manual. Please file and use this simplified servicemanual together with the main service manual Order No. MTNC030623C1(CT-25L8G).

Panasonic
BBE

⚠ WARNING

This service information is designed for experienced repair technicians only and is not designed for use by the general public.
It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product.
Products powered by electricity should be serviced or repaired only by experienced professional technicians. Any attempt to service or repair the product or products dealt with in this service information by anyone else could result in serious injury or death.

Panasonic®

IMPORTANT SAFETY NOTICE

There are special components used in this equipment which are important for safety. These parts are marked by ⚠ in the Schematic Diagrams, Circuit Board Diagrams, Exploded Views and Replacement Parts List. It is essential that these critical parts should be replaced with manufacturer's specified parts to prevent shock, fire or other hazards. Do not modify the original design without permission of manufacturer.

1. Safety precautions

General guidelines

An isolation transformer should always be used during the servicing of a receiver whose chassis is not isolated from AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injuryfrom electrical shocks. It will also protect the receiver from being damaged by accidental shorting that may occur during servicing.
When servicing, observe the original lead dress, especially in the high voltage circuit. Replace all damaged parts (also parts that show signs of overheating.)
Always replace protective devices, such as fish paper, isolation resistors and capacitors, and shields after servicing the receiver. Use only manufacturer’s recommended rating for fuses, circuits breakers, etc.
High potentials are present when this receiver is operating. Operation of the receiver without the rear cover introduces danger for electrical shock. Servicing should not be performed by anyone who is not thoroughly familiar with the necessary precautionswhen servicing high voltage equipment.
Extreme care should be practiced when handling the picture tube. Rough handling may cause it to implode due to atmospheric pressure. (14.7 lbs per sq. in.). Do not nick or scratch the glass or subject it to any undue pressure. When handling, usesafety goggles and heavy gloves for protection. Discharge the picture tube by shorting the anode to chassis ground (not to the cabinet or to other mounting hardware). When discharging connect cold ground (i.e. dag ground lead) to the anode with a wellinsulated wire or use a grounding probe.Avoid prolonged exposure at close range to unshielded areas of the picture tube to prevent exposure to x-ray radiation.
The test picture tube used for servicing the chassis at the bench should incorporate safety glass and magnetic shielding. The safety glass provide shielding for the tube viewing area against x ray radiation as well as implosion. The magnetic shieldlimits the x ray radiation around the bell of the picture tube in addition to the restricting magnetic effects. When using a picture tube test jig for service, ensure that the jig is capable of handling 50kV without causing x ray radiation.
Before returning a serviced receiver to the owner, the service technician must thoroughly test the unit to ensure that is completely safe to operate. Do not use a line isolation transformer when testing.

Leakage current cold check

Unplug the A.C. cord and connect a jumper between the two plug prongs.Measure the resistance between the jumpered AC plug and expose metallic parts such as screwheads, antenna

terminals, control shafts, etc. If the exposed metallic part has a returnpath to the chassis, the reading should be between 240k Ω and 5.2M Ω . If the exposed metallic part does not have a return path to the chassis, the reading should be infinite.

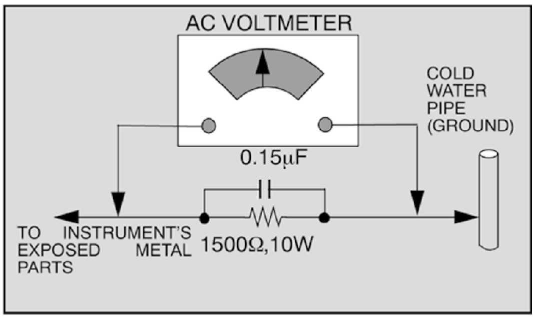
Leakage current hot check

Plug the AC cord directly into the AC outlet. Do not use an isolation transformer during the check. Connect a 1.5k Ω 10 watt resistor in parallel with a 0.15 μ F capacitor between an exposed metallic part and ground. Use earth ground, for example a water pipe.

Using a DVM with a 1000 ohms/volt sensitivity or higher, measure the AC potential across the resistor.

Repeat the procedure and measure the voltage present with all other exposed metallic parts. Verify that any potential does not exceed 0.75 volt RMS. A leakage current tester (such a Simpson model 229, Sencore model PR57 or equivalent) may be used in the above procedure, in which case any current measure must not exceed 0.5 milliamp. Ifany measurement is out of the specified limits, there is a possibility of a shock hazard and the receiver must be repaired and rechecked before it is returned to the customer.

Hot check circuit



Insulation test

Connect an insulation tester between an exposed metallic part and A.C. line. Apply 1080VAC/ 60Hz for 1 second. Confirm that the current measurement is 0.5mA ~ 2.0mA. Repeat test with other metallic exposed parts.

X ray radiation

WARNING

The potential source of x-ray radiation in the TV set is in the high voltage section and the picture tube.

NOTE

It is important to use an accurate, calibrated high voltage meter.

Set the brightness, picture, sharpness and color controls to minimum.

Measure the high voltage. The high voltage should be 28.4 ± 1.25kV for 20” models and 30.55 ± 1.25kV for 24” models. If the upper limit is out of tolerance, immediate serviceand correction is

required to insure safe operation and to prevent the possibility of premature component failure.

Horizontal oscillator disable circuit test

This test must be performed as a final check before the receiver is returned to the customer. See horizontal oscillator disable circuit procedure check in this manual.

2. Service notes

NOTE

These components are affixed with glue. Be careful not to break or damage any foil under the component or at the pins of the ICs when removing. Usually applying heat to the component for a short time while twisting with tweezers will break the component loose.

Leadless chip component (surface mount)

Chip components must be replaced with identical chips due to critical foil track spacing. There are no holes in the board to mount standard transistors or diodes. Some chips capacitor or resistor board solder pads may have holes through the board,however the hole diameter limits standard resistor replacement to 1/8 watt. Standard capacitor may also be limited for the same reason. It is recommended that identical components be used.

Chip resistor have a three digit numerical resistance code, 1st and 2nd significant digits and a multiplier. Example: 162 = 1600 or 1.6k Ω resistor, 0 = 0 Ω (jumper).

Chip capacitors generally do not have the value indicated on the capacitor. The color of the component indicates the general range of the capacitance.

Chip transistors are identified by a two letter code. The first letter indicates the type and the second letter, the grade of transistor.

Chip diodes have a two letter identification code as per the code chart and are a dual diode pack with either common anode or common cathode. Check the parts list for correct diode number.

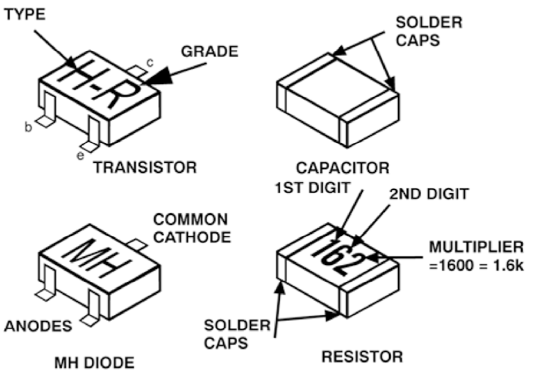
Component removal

1. **Use solder wick to remove solder from component end caps or terminal.**
2. **Without pulling up, carefully twist the component with tweezers to break the adhesive.**
3. **Do not reuse removed leadless or chip components since they are subject to stress fracture during removal.**

Chip component installation

1. **Put a small amount of solder on the board soldering pads.**

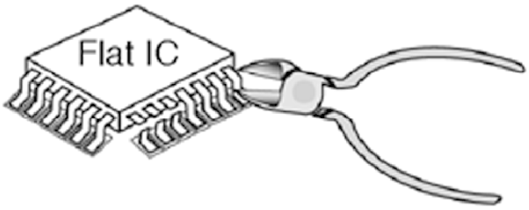
2. **Hold the chip component against the soldering pads with tweezers or with a miniature alligator clip and apply heat to the pad area with a 30 watt iron until solder flows. Do not apply heat for more than 3 seconds.**


TYPE
GRADE
H-R
c
b
e
TRANSISTOR
SOLDER CAPS
CAPACITOR
1ST DIGIT
2ND DIGIT
COMMON CATHODE
MH
162
MULTIPLIER =1600 = 1.6k
ANODES
MH DIODE
SOLDER CAPS
RESISTOR

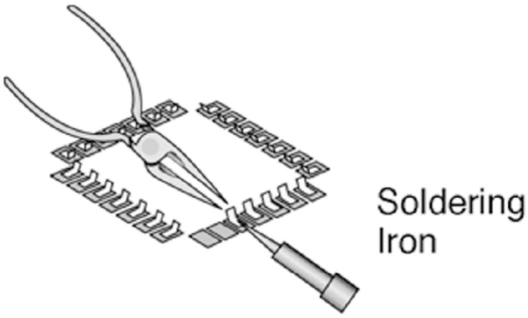
Chip components

How to replace flat IC (required tools)

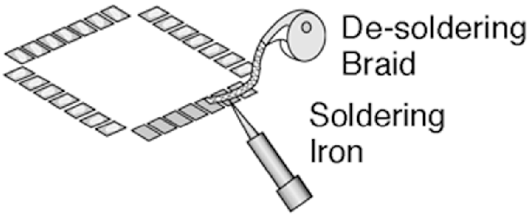
1. **Remove the solder from all of the pins of a Flat IC by using a desolder braid**



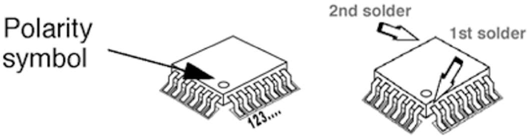
2. **Put the iron wire under the pins of the Flat IC and pull it in the direction indicated while heating the pins using a soldering iron. A small awl can be used instead of the iron wire.**


Soldering Iron

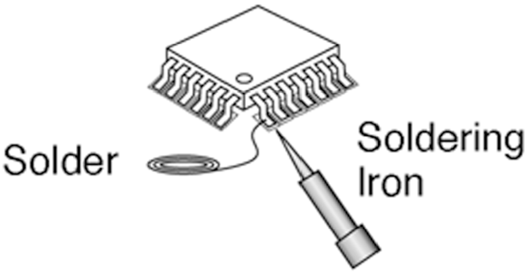
3. **Remove the solder from all the pads of the Flat IC by using a de solder braid**


De-soldering
Braid
Soldering
Iron

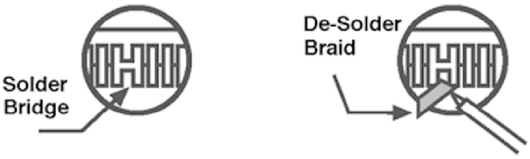
4. Position the new Flat IC in place (apply the pins of the Flat IC to the soldering pads where the pins need to be soldered). Properly determine the positions of the soldering pads and pins by correctly aligning the polarity symbol


Polarity
symbol
123....
2nd solder
1st solder

5. Solder all pins to the soldering pads using a fine tipped soldering iron


Solder
Soldering
Iron

6. Check with a magnifier for solder bridge between the pins or for dry joint between pins and soldering pads. To remove a solder bridge, use a de solder braid as shown in the figure below


Solder
Bridge
De-Solder
Braid

IMPORTANT

To protect against possible damage to the solid state devices due to arching or static discharge, make certain that all ground wires and CRT DAG wire are securely connected.

CAUTION

The power supply circuit is above earth ground and the chassis cannot be polarized. Use an isolation transformer when servicing the receiver to avoid damage to the test equipment or to the

chassis. Connect the test equipment to the proper ground(hot) or (cold) when servicing, or incorrect voltages will be measured.

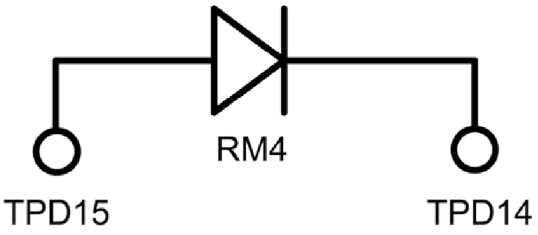
2.1. X-Ray Protection Circuit Check& Adjustments

This test must be performed as final check before the receiver is returned to the customer. If voltages are out of tolerance, immediate service and correction is required to insure safe operation and to prevent the possibility of premature componentfailure.

Equipment:

1. Isolation transformer.
2. High voltage meter.
3. D.C. Ammeter
4. Short jumper.
5. HHS jig (See figure below).

Diode Connection Jumper.



Preparation:

1. Make sure the receiver is turned off.
2. Connect the receiver to an isolation transformer.
3. Connect the ammeter serial from the flyback anode lead to the picture tube anode socket.
4. Prepare short jumper and HHS jig.

Procedure:

1. Connect the short jumper between TPD16 & TPD17.
2. Connect the jumper diode between TPD14 and TPD15 (anode connected to TPD15 and cathode to TPD14).
3. Apply 75VAC to AC input of isolation transformer.
4. Turn the receiver on.

5. **Apply a monoscope pattern.**
6. **Set customer picture and brightness controls to the minimum.**
7. **Set current within 50 μ A to 100 μ A by changing the picture and bright controls.**
8. **Slowly increase AC voltage at the input of the isolation transformer and confirm HHS voltage measure 34.5kV.**
9. **Turn power off and remove jigs.**

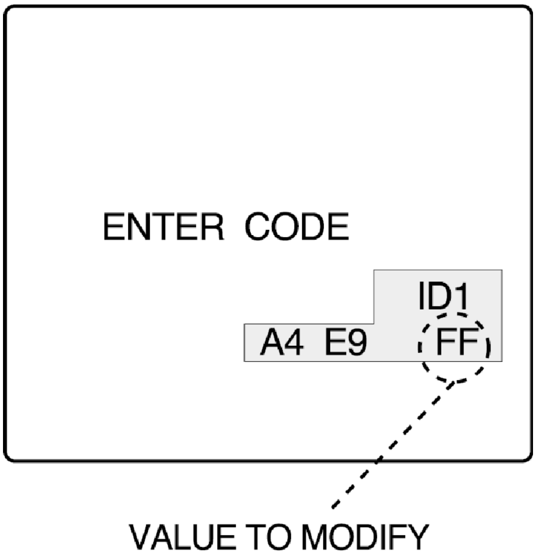
3. EEPROM replacement

If a new EEPROM integrated circuit is replaced for servicing, follow the next procedure once that the memory is properly assembled:

1. **Enter to service mode.**
2. **Turn the TV set ON.**
3. **Once inside service mode the first image that appears on-screen is the ID1 register with the respective address value (FF) like the image below.**

   Note:

   All 3 registers (ID1,ID2,ID3) should appear with FF values if a new EEPROM is assembled.



4. **With "VOL" keys adjust the correct value according with the service adjustment table (see "Service Mode" section).**
5. **Change to the next ID switch register with "CH" keys and repeat**

the same procedure as step 4.

6. **When replacing a new EEPROM be sure to set the correct ID switch values for each model.**
7. **Once that all 3 registers are set with the correct address value, perform all of the remaining adjustments and servicing.**

IMPORTANT:

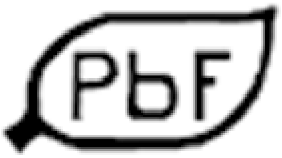
Correct ID switch configuration should be input when replacing EEPROM for each television model, otherwise if wrong values are configured, the television software will not function accordingly and properly.

4. About lead free solder (PbF)

NOTE

Lead is listed as (Pb) in the periodic table of elements. / In the information below, Pb will refer to lead solder, and PbF will refer to Lead Free Solder. / The lead free solder used in our manufacturing process and discussed below is (Sn+Ag+Cu). / Thatis Tin (Sn), Silver (Ag) and Copper (Cu) although other types are available.

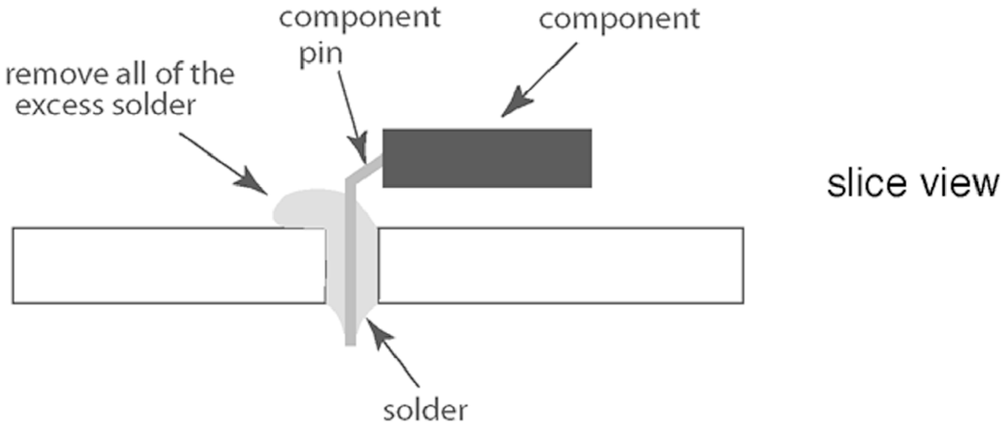
This model uses Pb Free solder in it's manufacture due to environmental conservation issues. For / service and repair work, we'd suggest the use of Pb free solder as well, although Pb solder may be / used. / PCBs manufacturedusing lead free solder will have the "PbF" or a leaf symbol stamped on the / back of PCB.



CAUTION

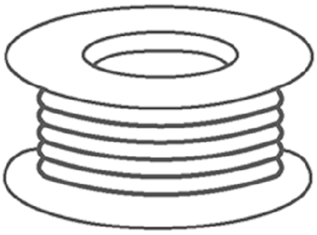
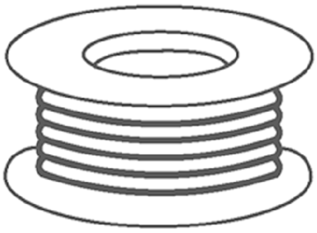
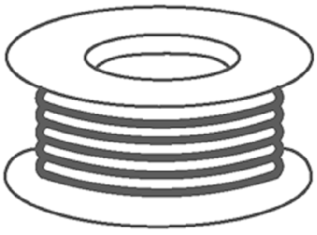
- **Pb free solder has a higher melting point than standard solder. Typically the melting point is 50 ~ 70 °F (30 ~ 40 °C) higher. Please use a high temperature soldering iron and set it to 700 ± 20 °F (370 ± 10 °C).**
- **Pb free solder will tend to splash when heated too high (about 1100 °F or 600 °C). / If you must use Pb solder, please completely remove all of the Pb free solder on the pins or solder area before applying Pb solder. If thisis not practical, be sure to heat the Pb free solder until it melts, before applying Pb solder.**
- **After applying PbF solder to double layered boards, please check the component side for excess solder which may flow onto the**

opposite side.


component pin
component
remove all of the excess solder
slice view
solder

Suggested Pb free solder

There are several kinds of Pb free solder available for purchase. This product uses Sn+Ag+Cu (tin, silver, copper) solder. However, Sn+Cu (tin, copper), Sn+Zn+Bi (tin, zinc, bismuth) solder can also beused.

0.3mm X 100g	0.6mm X 100g	1.0mm X 100g
		

5. Receiver feature table

FEATURE/MODEL	CT-20SL13G	CT-24SL13G
CHASSIS	AP414	BP401
MICRO	128K	
MENU LANGUAGE	ENG/SPAN/FR	
CLOSED CAPTION	X	
V-CHIP (USA/CANADA)	X	
CHANNEL COUNT	181	
CHANNEL INFO BANNER	X	
VIDEO INPUT SKIP	SKIP	
75 OHM INPUT	X	
REMOTE CONTROL	EUR7613Z60	
CRT SUPPLIER	SAMSUNG	MDDM (FLAT)
FAMILY	NA10	
COMB FILTER	3 DIG	
HEC/VEC (X=BOTH)	X	
VM	---	X
V/A NORM (X=BOTH)	V	
COLOR TEMP	X	
PRESET/INPUT LABELING	X	
VIDEO INPUT PICTURE MEMORY	X	
MTS/SAP/DBX	X	
BUILT-IN AUDIO POWER	5Wx2	
No. OF SPEAKERS	2	
BASS/BAL/TREBLE CONTROL	X	
AI SOUND	X	
SURROUND	X	
SPATIALIZER/BBE	BBE	
A/V IN (REAR/FRONT)	3(2/1)	
AUDIO OUT (FAO: F, VAO: V)	F, V	
COMPONENT INPUT (Y, Pb, Pr)	1	
S-VIDEO INPUT (REAR/FRONT)	1/0	
EPJ/HPJ/MISC	HPJ	
DIMENSIONS(WxDxH)	610.4x500.48x478.16mm24[illegible]	695x[illegible]mm27.36x18.26x21.19in
WEIGHT (Kg/Lbs)	24.5/54.01	34/74.95

Note:
Specifications are subject to change without notice or obligation. Dimensions and weights are approximate.

6. Board description table

CT-20SL13G

BOARD	PART NUMBER	DESCRIPTION
A	TNP2AH047CD	MAIN BOARD
C	TNP2AA122CB	CRT BOARD

CT-24SL13G / CT-24SL13UG

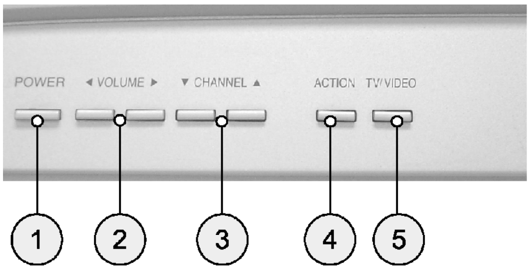
BOARD	PART NUMBER	DESCRIPTION
A	TNP2AH047DB	MAIN BOARD
C	TNP2AA157AH	CRT BOARD
Q	TNP2AA152	PINCUSHION GAIN BOARD

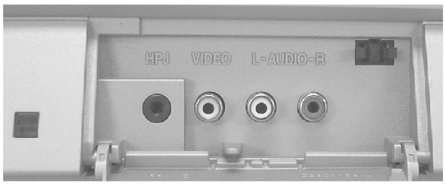
NOTE
When ordering a replacement board assembly, append an “S” to the board number

EXAMPLE
To order the A Board, for CT-24SL13G the replacement board is TNP2AH047DBS.

7. TV Location of controls

Panasonic
BBE


POWER
◄ VOLUME ►
▼ CHANNEL ▲
ACTION
TV/VIDEO
1
2
3
4
5

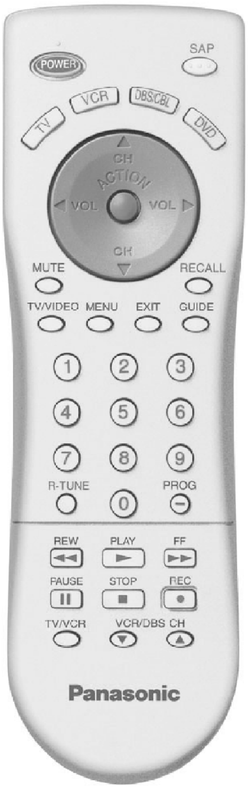

HPJ
VIDEO
L-AUDIO-R

IR Sensor
& Front A/V jacks

Quick reference control operation	
①	**Power** - Press to turn ON or OFF.
②	**Volume** - Press to adjust sound level, or to adjust audio menus, video menus, and select operating features when menus are displayed
③	**Channel** - Press to select programmed channels. Press to highlight desired features when menus are displayed. Also use to select cable converter box channels after programming remote control infra-red codes (the TV/AUX/CABLE switch must be set in CABLE position).
④	**Action** - Press to display main menu and access on screen feature and adjustment menus.
⑤	**TV/Video** - Press to select TV or one of the video inputs.

8. Location of controls (remote)

8.1. EUR7613Z60


POWER
SAP
TV
VCR
DBS/CBL
DVD
CH
ACTION
VOL
VOL
CH
MUTE
RECALL
TV/VIDEO
MENU
EXIT
GUIDE
1
2
3
4
5
6
7
8
9
R-TUNE
0
PROG
REW
PLAY
FF
PAUSE
STOP
REC
TV/VCR
VCR/DBS CH
Panasonic

POWER
Press to turn ON and OFF.

TV - VCR - DBS/CBL - DVD
Press to select a component.

MUTE
Press to mute sound.

TV/VIDEO
Press to select TV, Video mode.

MENU
Press to select TV, Video mode.

KEYBOARD
Press to select any channel.

R-TUNE
Press to switch to previously viewed channel or video mode.

SAP
Press to acces the secondary audio program broadcast.

CH
Press to select next or previous channel and navigate in menus.

VOL
Press to adjust TV sound and navigate in menus.

RECALL
Press to display time, channel sleep timer and other options.

GUIDE
DBS and DVD functions button.

EXIT
DBS menu function button.

PROG
Press for delimiter between major and minor channel number.

Note:
For additional information about this remote please refer to the owner’s manual section remote operation, listed on the parts list section.

9. Dissasembly for service

Back cover
Remove all the screws marked with an arrow (←) from the back of the receiver

NOTE
Screw configuration, type, and number of screws vary depending on the model of the receiver serviced and the application; various models are covered in this manual. Use same hardware when reassembling the receiver.

- **3 screws at the top edge of the receiver.**
- **1 screw by the A/V jacks.**
- **1 screw at each lower corner of the receiver.**
- **1 screw by the Flyback.**

A-Board - Main chassis

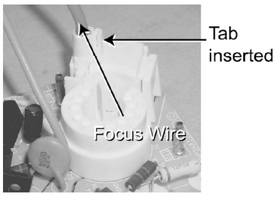
1. **Slide the chassis completely out of the guide rails.**
2. **Stand the receiver on its edge. The underside of the board is completely accessible for component replacement.**

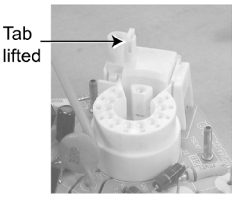
Note:
Some tie-wraps that secure the wire dressings may need to be unfastened for chassis removal.

C-Board - CRT output

The board plugs onto the socket on the CRT neck. To release the Focus wire, use a dull object to release the tab on the socket (near the wire opening) and carefully pull on the wire. To connect the focus wire, press on the tab to lock it then insertthe wire in the opening and press on it until it is fully inserted and locked in place. 24” models uses an additional screen wire that plugs into the CRT socket. Use the same procedure of the focus wire. Carefully disconnect C1, C2, C11,C12, C13 and C21 connectors.

Focus cable release





Q-Board - Pincushion Gain

Carefully disconnect Q1 connector and remove the board from the 3 fasteners pressing from the sides on each one.

Speakers

Each speaker is secured to the cabinet with 4 screws.

NOTE

When reassembling speakers be sure to connect the speaker wires to the correct speaker lead (+) (-)

9.1. Disassembly for CRT replacement

1. **Discharge the CRT as instructed in the “safety precautions”.**
2. **Disconnect the yoke (DY) plug, degaussing coil (DEG) plug from the main board.**
3. **Unplug the CRT 2nd anode button from the main board.**
4. **Remove the C-Board from the CRT base and unplug the black wires (CRT dag ground) C11 & C21.**
5. **Disconnect the speakers plug from the A-Board.**
6. **Lift the main chassis (A-Board) and all mounted boards completely out with the CRT board attached.**
7. **Perform complete removal of chassis, as instructed in “disassembly for service” section.**

CRT replacement

1. **Perform “disassembly for CRT replacement” procedure.**
2. **Insure that the CRT H.V. Anode button is discharged before handling the CRT. Read the “safety precautions” section on handling the picture tube.**

3. Remove the components from the CRT neck and place the cabinet face down on a soft pad.
4. Note the original order for the CRT mounting hardware as they are remove from the CRT mounting brackets at each corner of the CRT.
5. Remove the CRT with the degaussing coil and the dag ground braid attached.
6. Note the original locations and mounting of the degaussing coil and the dag ground assembly to insure proper reinstallation on the replacement CRT.

   To remove and remount the degaussing coil:

   - Unhook the coil spring from the bottom corners of the CRT ears.
   - Release the braid loop from the upper corners of the CRT ears.
7. Mount the dag ground braid on the replacement CRT. Position the degaussing coil with new ties.

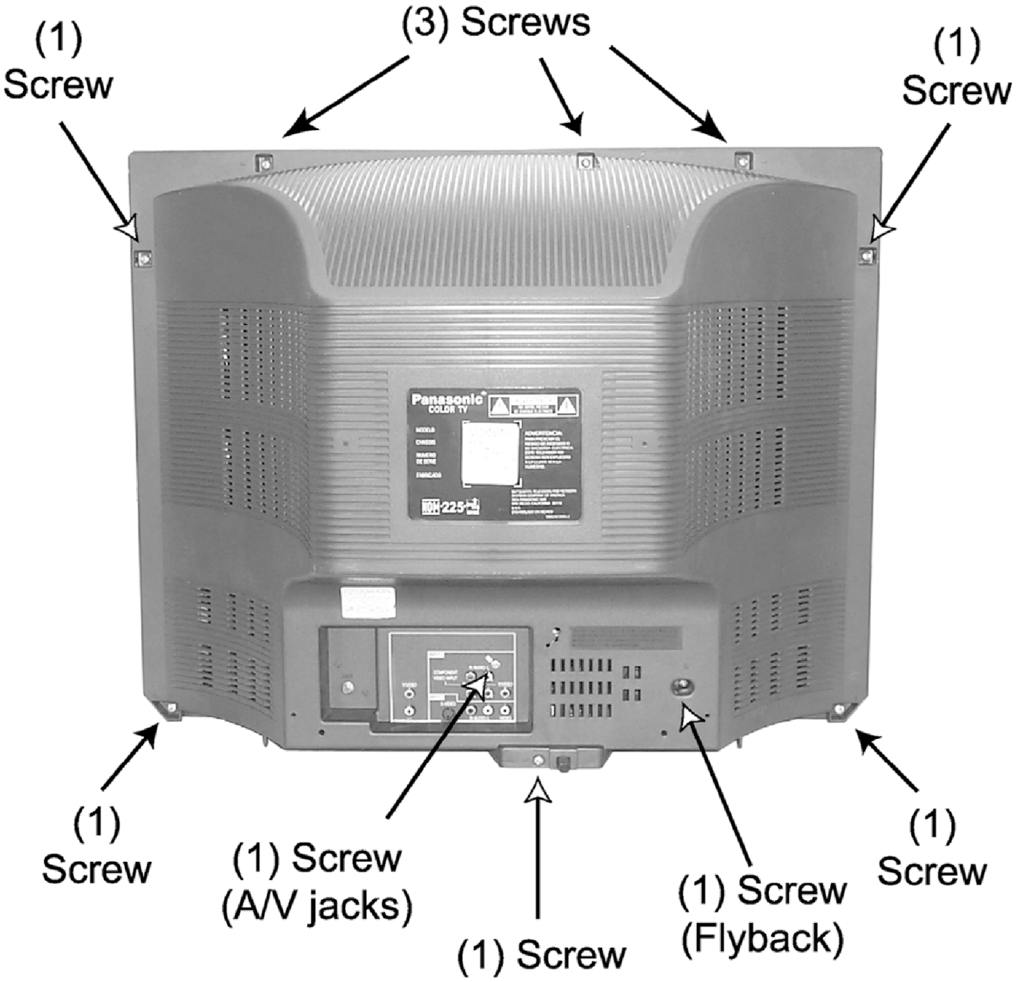
   Dress coil as was on the original CRT.
8. Replace the components on CRT neck and reinstall into cabinet. Verify that all ground wires and circuit board plugs get connected.

   IMPORTANT NOTICE

   When ordering the CRT, please order CRT and CRT kit also.

   Please see parts list section for part numbers.

9.2. Back cover removal


(1) Screw
(3) Screws
(1) Screw
(1) Screw
(1) Screw (A/V jacks)
(1) Screw
(1) Screw (Flyback)
(1) Screw

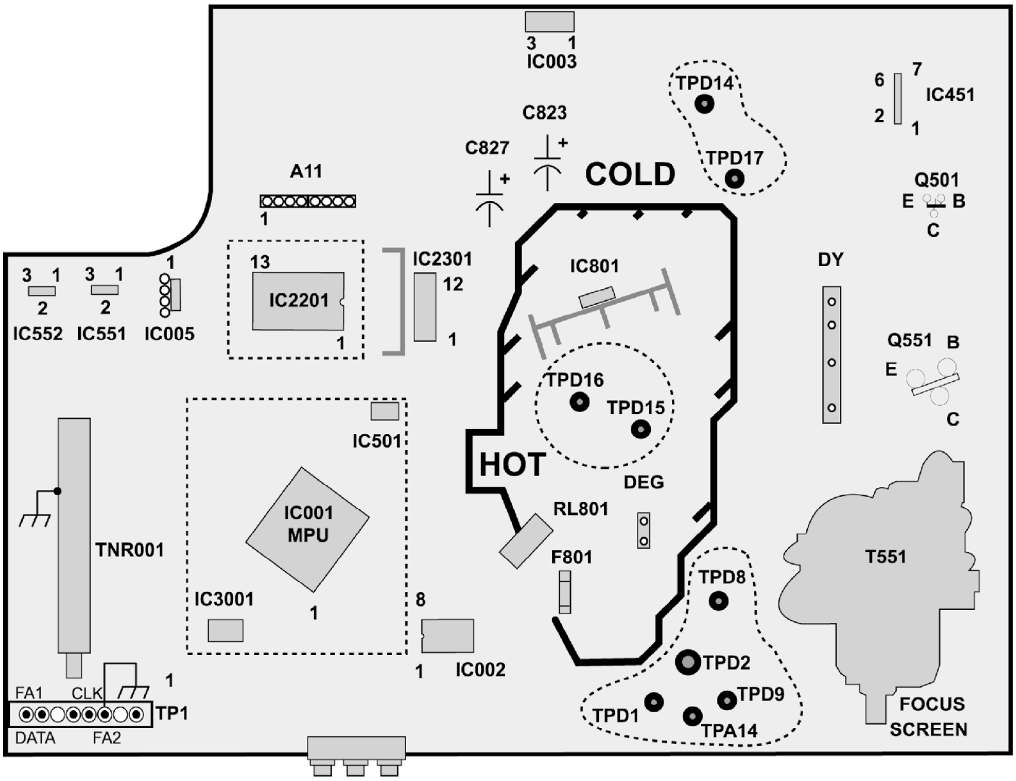
10. Chassis service adjustment procedures

All service adjustments are factory preset and should not require adjustment unless controls and/or associated components are replaced.

Note:

Connect the (-) lead of the voltmeter to the appropriate ground. Use IC801's heat sink when the HOT ground symbol is used. Otherwise, use COLD ground (tuner shield, IC451's heat sink or FA2).

Component and voltage test points


3 1
IC003
TPD14
C823
C827
COLD
TPD17
6 7
IC451
2 1
Q501
E B
C
A11
1
3 1 3 1
2 2
IC552 IC551 IC005
1
13
IC2201
1
IC2301
12
1
IC801
DY
Q551 B
E
C
TPD16
TPD15
IC501
HOT
DEG
RL801
IC001
MPU
TNR001
F801
T551
TPD8
IC3001
1
8
1 IC002
TPD2
TPD9
TPD1
TPA14
FOCUS
SCREEN
FA1 CLK
1
TP1
DATA FA2

Note:

Components and test points within doted areas are located on trace side.

B+ voltage check

1. **Set the BRIGHT and PICTURE to minimum by using the PICTURE menu.**
2. **Connect the DVM between C825 (+ side) or TPD14 and cold ground.**
3. **Confirm that B+ voltage is 131.0V ± 2.0V. This voltage supplies B+ to the horizontal output and flyback circuits.**

Source voltage chart

120V AC line input. Set the BRIGHT and the PICTURE to minimum by using the PICTURE menu. Use cold or hot ground for the (-) lead of the DVM as needed.

A-BOARD	TEST POINT	VOLTAGE	
		SAMSUNG CRT	MDDM CRT
+B2	TPD14	131.0 ± 2.0V	131.0 ± 2.0V
SOUND	C823 (+)	22.7 ± 1.0V	22.7 ± 1.0V
STB12V	C827 (+)	12.7 ± 1.0 V	12.8 ± 1.0 V
220V	TPA14	210 ± 10 V	205 ± 10 V
VERTICAL	TPD8	23.7 ± 1.5V	27.4 ± 1.5V
9V	IC551 pin 3	9.0 ± 0.5V	9.0 ± 0.5V
5V	IC552 pin 3	5.0 ± 0.5V	5.0 ± 0.5V
3.3V	IC005 pin 2	3.3 ± 0.3V	3.3 ± 0.3V
EHT	CRT anode	28.4 ± 1.25kV	30.55 ± 1.25kV
HEATER	JK351 H-HGND	6.2 ± 0.24V	6.3 ± 0.24V

High voltage check

1. Select an active TV channel and confirm that horizontal is in sync.
2. Adjust BRIGHTNESS and CONTRAST using PICTURE icon menu so video just disappears.
3. Using a high voltage meter confirm that the high voltage is 28.4 ± 1.25kV for 20” models and 30.55 ± 1.25kV for 24” models.

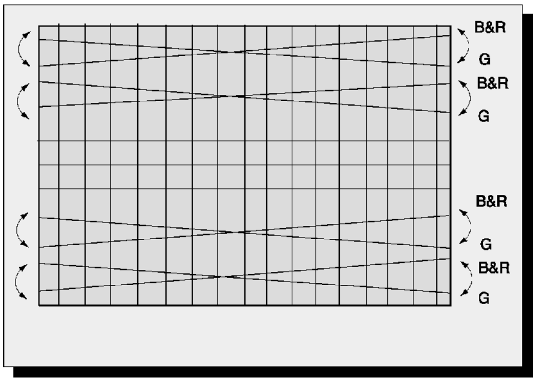
11. Service mode (mechanical controls)

11.1. Dynamic convergence adjustment (for 24” models only)

YV Adjustment / (VR1 for Horizontal dynamic convergence)

1. Apply a crosshatch pattern.
2. Adjust contrast and brightness customer controls to obtain a correct picture.
3. With a driver Adjust VR1 (located in deflection yoke board to obtain a proper convergence at top and bottom of the screen.

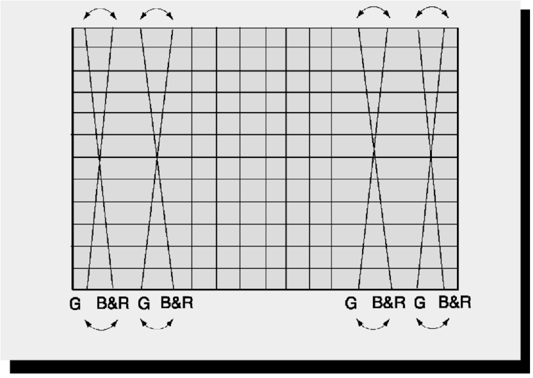
VR1 Adjustment (Yv)



YH Adjustment / (VR2 for vertical dynamic convergence)

1. **Apply a crosshatch pattern.**
2. **Adjust contrast and brightness customer controls to obtain a correct picture.**
3. **With a driver Adjust VR2 (located in deflection yoke board to obtain a proper convergence at left and right side of the screen.**

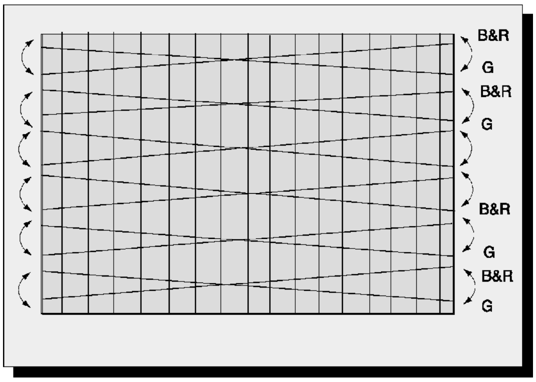
VR2 Adjustment (YH)



XV Adjustment / (precise adjustment)

1. **Apply a crosshatch pattern.**
2. **Adjust contrast and brightness customer controls to obtain a correct picture.**
3. **With a driver adjust the coil located in deflection yoke board to obtain a proper horizontal convergence .**

Xv adjustment



12. Service mode (electronic adjustments)

This receiver has electronic technology using the I^{2}C bus concept. It performs as a control function and it replaces many mechanical controls. Instead of adjusting mechanical controls individually, many of the control functions are nowperformed by using "on screen display menu". (The service adjustment mode).

NOTE
It is suggested that the technician reads all the way through and understand the following procedure for entering/exiting the service adjustment mode; then proceed with the instructions working with the receiver. When becoming familiarwith the procedure, the flow chart for service mode may be used as a quick guide.

Quick entry to service mode

When minor adjustments need to be done to the electronic controls, the method of entering the service mode without removal of the cabinet back is as follows using the remote control:

1. **Select SET-UP icon and select CABLE mode.**
2. **Select TIMER icon and set SLEEP time for 30 Min.**
3. **Press "ACTION" twice to exit menus.**
4. **Tune to the channel 124.**
5. **Adjust VOLUME to minimum (0).**
6. **Press VOL → (decrease) on receiver. Red "CHK" appears in upper corner.**

To toggle between aging and service modes:

While the "CHK" is displayed on the left top corner of the CRT, pressing "ACTION" and "VOL" UP on the TV simultaneously will toggle between the modes. Red "CHK" for serviceand yellow "CHK" for aging.

7. **Press POWER on the remote control to display the service**

adjustment modes menu, select adjustment by pressing the volume right/left buttons and channel up/down buttons on the remote and ACTION to enter the adjustment.

MTS	MTSIN	SEPAL	SEPAH	
CLOCK	CLOCK			HHSTH
VIDEO	COLOR	TINT	BRIGH	CONT
	B-Y_G	CUT_G	CUT_R	CUT_B
	BRT	R-DR	B-DR	
HDEF	H-POS	H-WID	PCC	
	TOPG	BTMG	TRAP	
FINE	PCCHG	PCCLG	PCCHS	PCCLS
	TOPSL	BTMSL		
VDEF	VEAMP	V-C	V-S	VPOS
SETID	ID1	ID2	ID3	

Exiting the service mode:

This TV goes out from service mode when it is unplugged or turned OFF. To exit the service mode, turn the TV OFF from or unplug the TV from A.C.

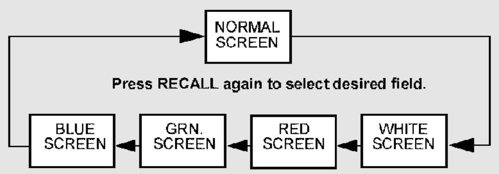
Other method

Press ACTION and POWER on the receiver simultaneously for at least 2 seconds.
The receiver momentarily shuts off; then comes back on tuned to channel 3 with a preset level of sound.
Any programmed channels, channels caption data and some others user defined settings will be erased when exited by pressing ACTION and POWER on receiver.

IMPORTANT NOTE
Always check that the TV exits the service mode.

To confirm colors

When in service mode (red "CHK" is displayed) press RECALL on the remote control to enter the purity field check mode



Press RECALL again to select desired field.

Figure 1. Purity check field mode.

Entering service mode (open-back method)

While the receiver is connected and operating in normal mode, momentarily short test point FA1 (TP1 pin 2) to cold ground (TP1 pin 3).

The receiver enters the aging mode.
Yellow letters “CHK” appear in the upper left corner of the screen. / (The volume right/left and channel up/down will adjust rapidly).

Note:

If service mode is accessed by this method be sure to reset the set after service is performed.

12.1. Service adjustment default values for items

NAME	DESCRIPTION	REGISTER VALUE	
		CT-20SL13G	CT-24SL1
MTSIN	MTS INPUT LEVEL	22	
SEPAL	MTS LOW LEVEL SEPARATION	0B	
SEPAH	MTS HIGH LEVEL SEPARATION	1C	
CLOCK	CLOCK	128	
HHSTH	HHS VOLTAGE LEVEL REFERENCE	9A	
COLOR	COLOR	15	
TINT	TINT	56	
BRIGH	SUB-BRIGHTNESS	54	
CONT	SUB-CONTRAST	70	
B-Y_G	MAGENTA TINT ADJ	80	
CUT_G	GREEN CUT-OFF	4F	
CUT_R	RED CUT-OFF	EC	
CUT_B	BLUE CUT-OFF	34	
BRT	BRIGHT	54	
R-DR	RED DRIVE	66	
B-DR	BLUE DRIVE	CD	
H-POS	HORIZONTAL POSITION	82	
H-WID	HORIZONTAL WIDTH	57	
PCC	PINCUSHION	35	
TOPG	TOP CORNER PINCUSHION	BA	
BTMG	BOTTOM CORNER PINCUSHION	B6	
TRAP	TRAPEZOID	84	
PCCHG	PINCUSHION HIGH	00	
PCCLG	PINCUSHION LOW	02	
PCCHS	PINCUSHION HIGH	00	
PCCLS	PINCUSHION LOW	00	
TOPSL	TOP CORNER PINCUSHION SLICE LEVEL	03	
BTMSL	BOTTOM CORNER PINCUSHION SLICE LEVEL	00	
VEAMP	VERTICAL SIZE	7E	
V-C	VERTICAL LINEARITY	4F	
V-S	VERTICAL SIZE CORRECTION	1E	
VPOS	VERTICAL POSITION	81	
ID1*	ID SWITCH 1	F8	FC
ID2*	ID SWITCH 2	1F	5F

NAME	DESCRIPTION	REGISTER VALUE	
		CT-20SL13G	CT-24SL1
ID3*	ID SWITCH 3	7B	7B

IMPORTANT:

These table values are approximated and could change due to variation of electrical characteristics in each set, except for the ID switch values.

***Note:**

The correspondent ID switch (ID1, ID2, ID3) data configuration should not be modified in any way. If EEPROM circuit needs to be replaced, these ID values should be configured according with this table.

13. Service adjustments (electronic controls)

NOTE

Please correlate with available pattern on all adjustments

13.1. Sub-Brightness and Contrast / Service DAC adjustment (BRIGH, CONT)

Adjustment of this control is important for setting proper operation of customer brightness and picture controls. Do not adjust the SCREEN VR after the sub-brightness is set.
This adjustment is factory set. Do not adjust unless repairs are made to associated circuit, the CRT Board or when the CRT is replaced.

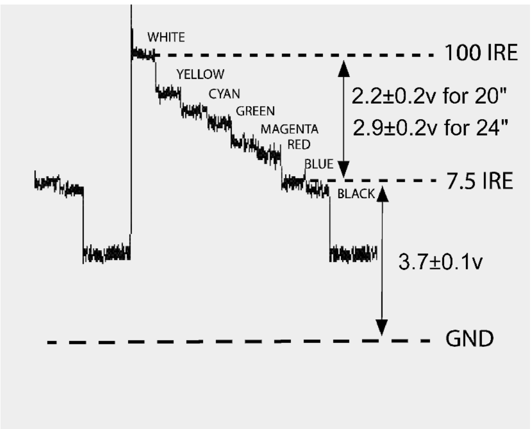
Preparation

1. **Apply a colorbar pattern.**
2. **Set the PICTURE control to the maximum.**
3. **Set COLOR control to minimum (no color on picture).**
4. **Set the BRIGHTNESS control to the center.**
5. **Set the SHARPNESS control to the center.**
6. **Connect the oscilloscope to TP35 (or TP47G).**

Procedure

1. **In the service mode, select DAC for brightness adjustment “BRIGH”, and adjust data to obtain 3.7±0.1V between 7.5 IRE and GND level at TP35 (TP47G). (See waveform detail).**

2. In service mode, select DAC for contrast adjustment “CONT”, and adjust data to obtain 2.2±0.1V (for 20” CRT) or 2.9±0.1V (for 24” CRT) between 7.5IRE and 100IRE level at TP35 (TP47G). (See waveformdetail).


WHITE
YELLOW
CYAN
GREEN
MAGENTA
RED
BLUE
BLACK
100 IRE
2.2±0.2v for 20"
2.9±0.2v for 24"
7.5 IRE
3.7±0.1v
GND

13.2. Color output adjustment / Service DAC adjustment (COLOR, TINT)

NOTE

if a rainbow pattern generator is available perform the following procedure; the next section describes the procedure with no rainbow pattern.

Make sure that sub-contrast adjustment was finished prior to perform this adjustment.

PREPARATION

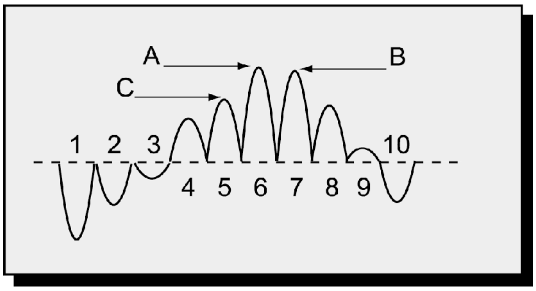
1. Normalize the picture settings.
2. Set the BRIGHTNESS control to minimum.
3. Set the COLOR control to the center.
4. Set the TINT control to the center.
5. Set the PICTURE control to the maximum.
6. Set the SHARPNESS control to the minimum.

PROCEDURE

1. Apply a rainbow color bar pattern.
2. Connect the oscilloscope to TP37 (or TP47B).

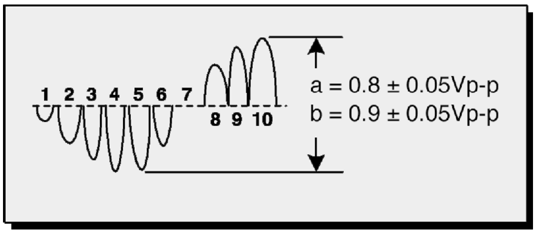
3. In service mode adjust “TINT” register until the waveform measured is as the one shown. Tint level from A and B peaks must be almost in the same level (0.35 Vp).

TP37 Waveform (TP47B).



4. Connect the oscilloscope to TP35 and GND.
5. Adjust “COLOR” register so that the amplitude is 0.8 ± 0.05Vp-p for 20” CRT and 0.9 ± 0.05Vp-p for 24” CRT (see figure below).

TP35 Waveform (TP47G).



13.3. Color output adjustment / Service DAC adjustment / (COLOR, TINT, B-Y_G)

NOTE

Color and tint adjustment sets the reference settings for the user controls; It is important to read the procedures.

(NO RAINBOW PATTERN)

Make sure that sub-contrast adjustment was finished prior to perform this adjustment

PREPARATION

Normalize the picture settings.

PROCEDURE

1. Apply a color bar pattern.

2. In service mode adjust “R DR” and “B DR” data to “80”.
3. In service mode adjust “TINT” data so that the color does not become greenish or redish.
4. In service mode adjust “COLOR” data so that the color level is not too high (saturated) or too low (tending to black and white).
5. In service mode adjust “B-Y G” data so that blue and green seem natural.
6. Confirm that saturation and picture are normal (normal image).
7. If image is not satisfactory, repeat adjustment until the image is normal and natural.

NOTE
The image can be compared against other set to see the image quality.

13.4. Color temperature adjustment / (B/W Tracking) / Service DAC Adjust. / (CUT R) (CUT G) (CUT B) (R DR) (B DR)

Minor Touch-Up Method

OBSERVE low and high brightness areas of a B/W picture for proper tracking. Adjust only as required for “good gray scale and warm highlights”.

1. LOW LIGHT areas - In service mode for making electronic adjustments, select CUT R, CUT G, CUT B and adjust the picture for gray.
2. HIGH LIGHT areas - In service mode for making electronic adjustments, select drive R DR, B DR and adjust the picture for warm whites.

Complete adjustment

PREPARATION

1. Turn the receiver “ON” and allow 30 minutes warm up at WHITE PATTERN.
2. Apply a color bar pattern (with no color).
3. Turn the SCREEN control (part of FBT T551) fully

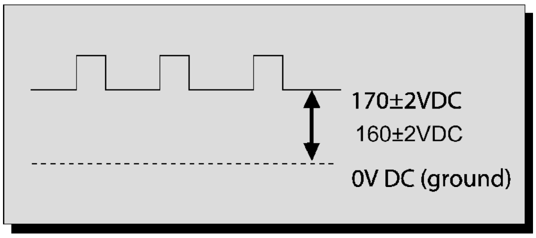
counterclockwise.

4. **Preset the following service DACs for best results:**

- BRIGH	**1 D0**
- CUT R	**02 00**
- CUT G	**02 00**
- CUT B	**02 00**
- R DR	**07 FF**
- B DR	**07 FF**

PROCEDURE

1. **Connect the oscilloscope to KG (CRT-Board).**
2. **In service mode for making electronic adjustment, select “BRIGH” DAC.**
3. **Press RECALL button on the remote control to collapse the raster. (service SW).**
4. **Connect oscilloscope to KG on C-Board and adjust service mode “CUT-G” DAC until 160 ± 2V(for 20” CRT) or 170±2V (for 24” CRT) above DC ground is measured.**
5. **Remove the probe from KG.**
6. **Turn screen clockwise slowly until color is slightly appeared.**
7. **Then adjust “CUT R” and “CUT B” until line becomes white.**
8. **Press RECALL button on the remote to restore the raster.**
9. **Adjust “R DR” and “B DR” so the white seems like white and black like black.**
10. **Apply a normal signal and confirm that the image is normal and a good gray scale.**
11. **If correction is needed perform minor touch-up method.**



13.5. Deflection adjustments

To reset deflection adjustments

To reset deflection adjustments to factory adjusted default, enter to service mode (with red CHK displayed), press POWER button on remote to display the service menu, then press and hold RECALL button for at least three seconds, a reset message will appear in the image.
Use this feature when deflection adjustment gets off adjustment to the point that it cannot be adjusted back easily.

13.5.1. H-Center adjustment

PREPARATION

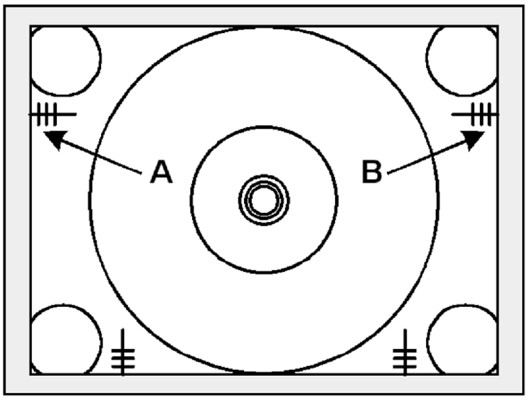
1. Apply a crosshatch pattern.

2. Normalize the picture settings.

PROCEDURE

1. Apply a monoscope pattern to center the picture.

Horizontal Center Adjustment



2. If the horizontal center is not aligned, in service mode adjust “H POS” DATA to adjust the horizontal center of the monoscope pattern to the CRT center.

3. Verify that horizontal width (A & B mark) is within 4.5 ± 0.7.

13.5.2. Horizontal width adjustment / (H-WID)

PREPARATION
Apply a pattern that permits the centering of the image.

Procedure:

1. Adjust “VRAS” data so that the picture is in the center and lines are straight (check mark on CRT sides).
2. Apply a crosshatch pattern.
3. Adjust “PCC” data to make lines straight.
4. Adjust “H-WID” data to correct vertical size of the image.
5. Adjust “VEAMP” data to correct vertical size of the image.

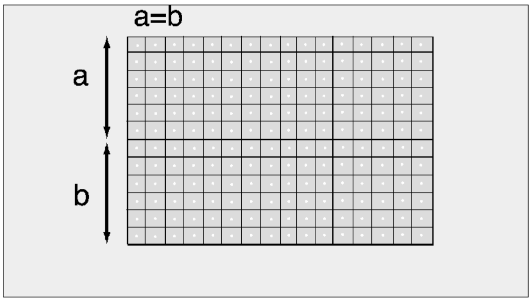
13.5.3. Vertical linearity(V-C), V-Size and V-Position adjustment

PREPARATION

1. Apply a crosshatch pattern
2. Normalize the picture settings.

PROCEDURE

1. Enter service mode, select DAC adjustment / “V-POS” and adjust monoscope pattern to the center vertical position of the CRT center mark.
2. Adjust linearity data “V-C” so that interval of “a” is same as “b” (a= b).

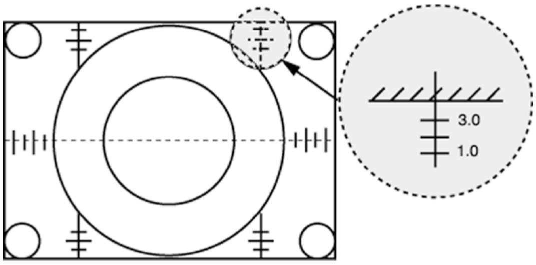


3. If the v-position is not at the CRT center, adjust / V position “V

POS” DATA again.

4. Apply a monoscope pattern.
5. Confirm that center horizontal line is in center mark on CRT.
6. Adjust “VEAMP” register for correct vertical size by making monoscope round circle leaving 4 marks off the CRT edge.

Vertical centering adjustment.



13.5.4. V-S Correction adjustment

PREPARATION

1. Apply a crosshatch pattern
2. Normalize the picture settings.

PROCEDURE

1. Enter to service mode
2. Check a and b sizes, If b-a < -1.5mm (in top & bottom extending case)

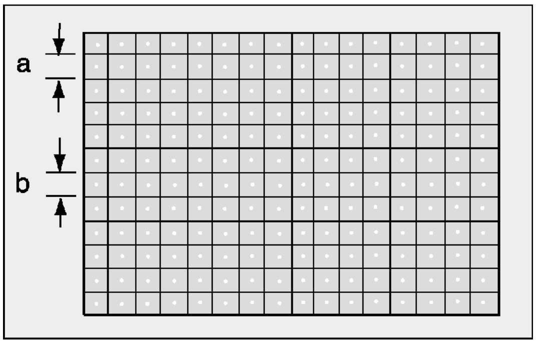
   - Increase “V-S” DATA by one step

NOTE

Repeat “a” and “b” until b-a ± 1.5mm

3. Confirm to make outermost circle of monoscope pattern a correct circle

V-Adjustment



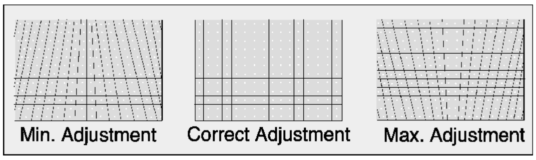
13.5.5. Trapezoid adjustment (TRAP)

PREPARATION

1. Apply a crosshatch pattern.
2. Normalize the picture icon video adjustments.

Procedure:

1. Enter service mode, select "TRAP" and adjust DATA so that lines at right and left are vertical like a solid line.



13.5.6. PCC adjustment (PCC)

This adjustment helps to correct left and right curved sides of picture.

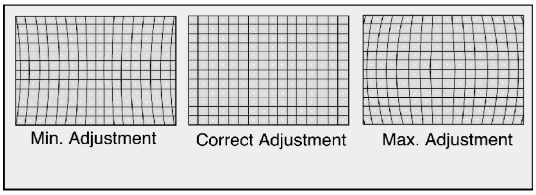
PREPARATION

1. Apply a crosshatch pattern.
2. Normalize the picture icon video adjustments.

Procedure:

1. Adjust "PCC" data so that the first and third line make a good balance (see figure below).

PCC Adjustment


Min. Adjustment
Correct Adjustment
Max. Adjustment

13.5.7. Corner PCC adjustment / (TOPG, TOPSL, BTMG, BTMSL)

This controls help to adjust top and bottom sides of picture.

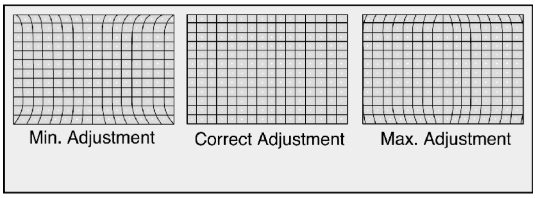
PREPARATION

1. **Apply a crosshatch pattern.**
2. **Normalize the picture icon video adjustments.**

Procedure:

1. **Adjust “TOPG” and “TOPSL” data to correct upper side of the image linearity.**
2. **Adjust “BTMG” and “BTMSL” data to correct lower side of the image (see figure below).**

Top and bottom adjustment


Min. Adjustment
Correct Adjustment
Max. Adjustment

13.6. MTS circuit adjustments

The MTS circuit adjustments require two steps:

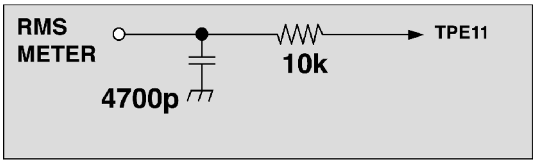
1. **Input level adjustment.**
2. **Stereo separation adjustment.**

Input level adjustment / Service DAC adjustment (MTSIN)

PREPARATION

1. **Connect an RMS meter with filter jig as shown in figure to TPE11.**

Filter Jig



2. Connect an RF signal generator to the RF antenna input.

PROCEDURE

1. Apply the following signal from the RF signal generator:

   - Video: 100 IRE flat field, 30% modulation.
   - Audio: 300Hz, 100% modulation, monaural (70 ±5dB, 75 Ω OPEN, P/S 10dB). Make sure that the 75 μ s pre-emphasis is OFF.

2. Adjust the MTS input level adjustment “MTSIN” data until the RMS voltage measured is 120 ± 4.0mVrms.

Stereo separation adjustment (SEPAH)

PREPARATION

1. Connect an R.F. signal generator to the RF antenna input.
2. Connect a scope to TPE10.

PROCEDURE

1. Select stereo mode in audio menu
2. Apply the following signal from the RF signal generator:

   - Video: 100 IRE flat field, 30% modulation.
   - Audio: 300Hz, 30% modulation, stereo (left only) (70±5dB, 75 Ω OPEN, P/S 10dB).

   NOTE
   After setting 30% modulation with P.L. SW and N.R. SW OFF, turn P.L. SW and N.R. SW ON.

3. In service mode, adjust the MTS Low-Level separation adjustment

"SEPAL" data until the amplitude displayed on the scope is minimum.

4. Apply the following signal from the RF signal generator:
    - Video: 100 IRE flat field, 30% modulation
    - Audio: 3KHz, 30% modulation, stereo (left only) (70 ±5dB, 75 Ω OPEN, P/S 10dB).

NOTE
After setting 30% modulation with P.L. SW and N.R. SW OFF, turn P.L. SW and N.R. SW ON.

5. Adjust the MTS High-level separation adjustment "SEPAH" until the amplitude displayed on the scope is minimum.
6. Repeat above steps 2 through 5 until the amplitude is at minimum for both signals.

13.7. Clock adjustment (CLOCK)

PREPARATION
Connect the frequency counter from TP017 / (IC001 pin 79) to cold ground

PROCEDURE

1. Turn the receiver "OFF" with the A.C. power applied.
2. Measure TP017 (IC001 pin 79) for the frequency of the waveform and record the reading.

NOTE

3. TP017 (IC001 pin 79) measurement must have at least four digits of resolution following the decimal point. Example: 000.0000
4. Place the receiver into service mode for making electronic adjustment, select the clock adjustment DAC "CLOCK".
5. Calculate and set "CLOCK" based on the following formula:

$$\text{CLOCK} = 128 - \left[\frac{(\text{TP017}_{freq} - 610.35)}{610.35} \times 450000 \right]$$

NOTE
TP017 (IC001 pin 79) measurement will not change regardless of the value stored in CLOCK.

13.8. Service Adjustments Mechanical Controls

WIDTH CORRECTION ADJUSTMENT

Note
Perform this adjustment only when FBT is changed.

FOCUS (PART OF T551)

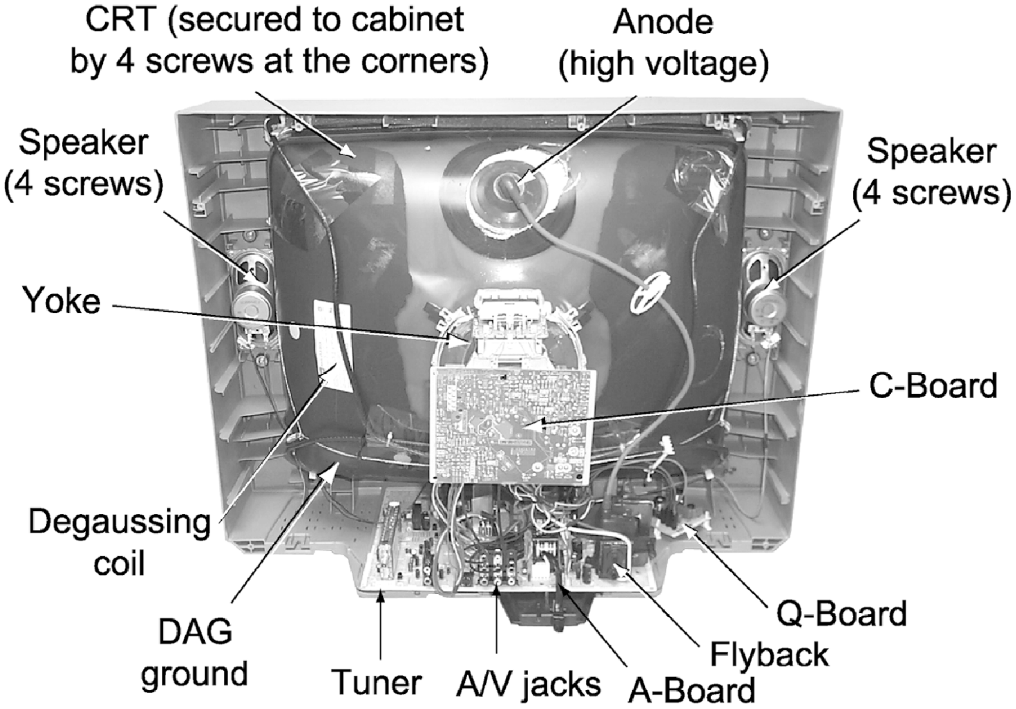
Preparation
Apply a crosshatch pattern with dots.

Procedure

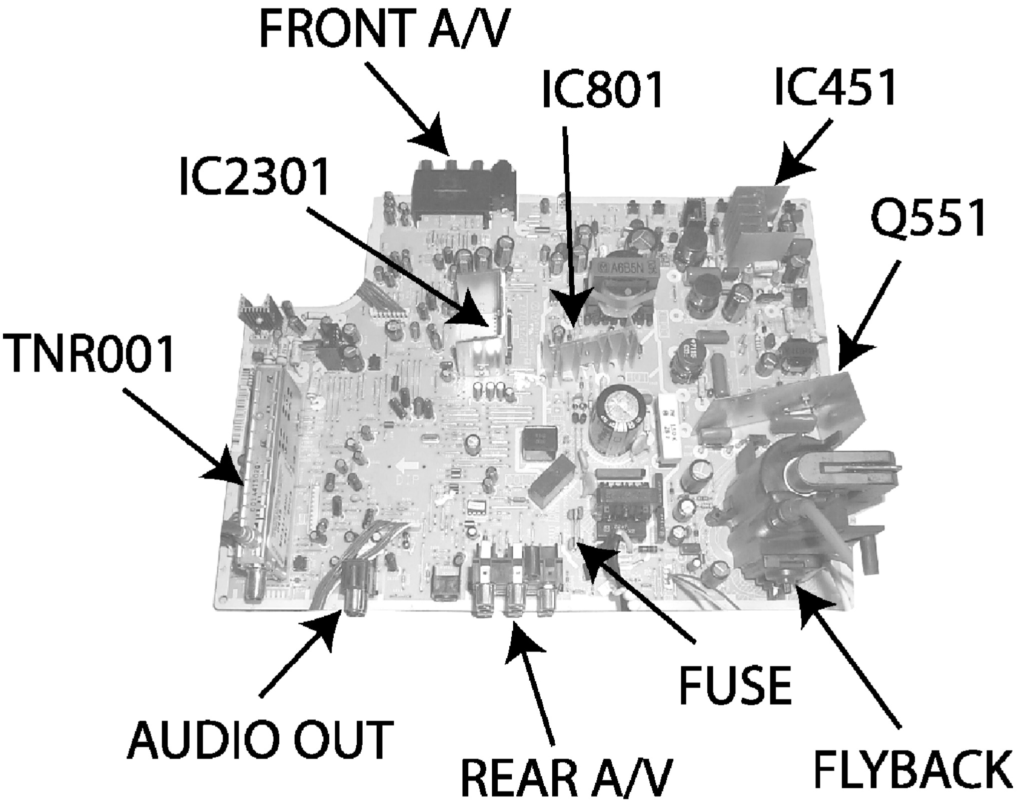
1. **Adjust the FOCUS VR to obtain the sharpest and clearest dot pattern.**
    - **Adjust for best center.**
    - **Adjust for best area between the center and top right corner.**

14. Identification of components

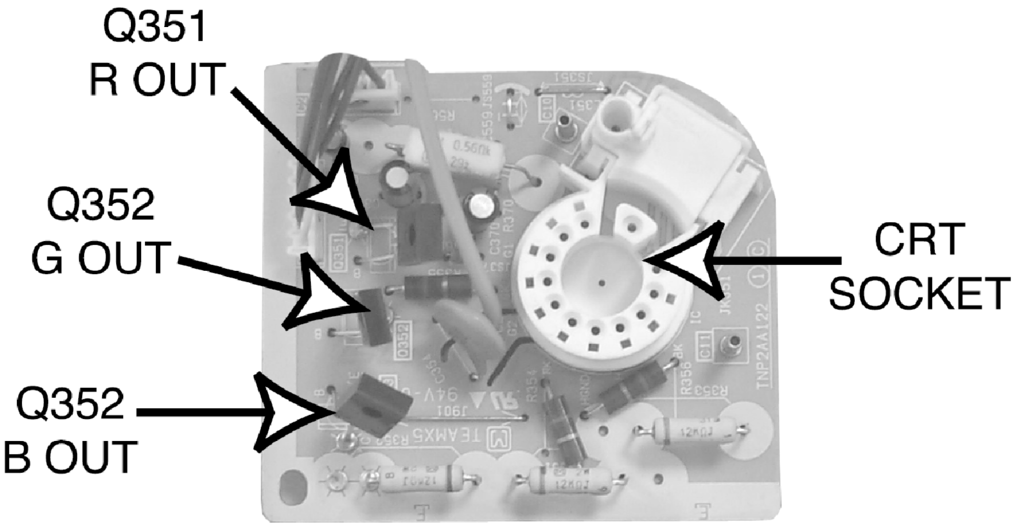
14.1. Chassis Components


CRT (secured to cabinet by 4 screws at the corners)
Anode (high voltage)
Speaker (4 screws)
Speaker (4 screws)
Yoke
C-Board
Degaussing coil
DAG ground
Tuner
A/V jacks
A-Board
Flyback
Q-Board

14.2. A-Board Chassis

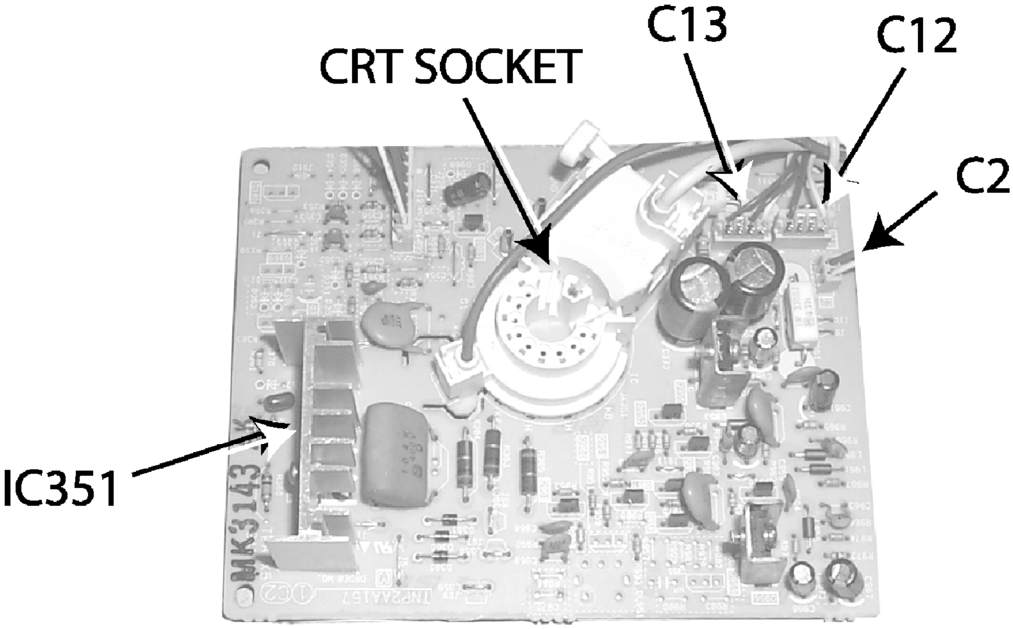

FRONT A/V
IC801
IC451
IC2301
Q551
TNR001
AUDIO OUT
REAR A/V
FUSE
FLYBACK

14.3. C-Board Chassis

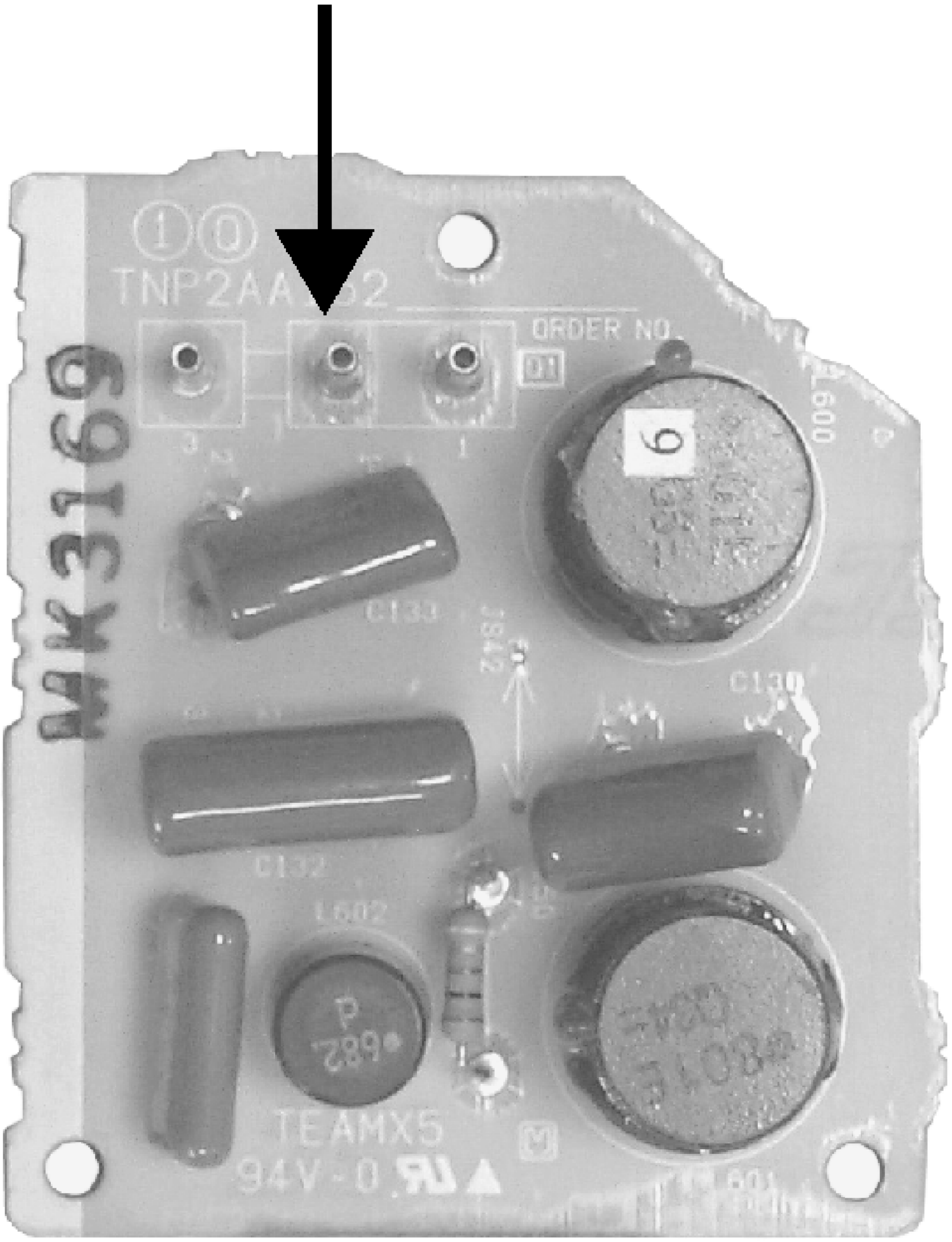

Q351
R OUT
Q352
G OUT
Q352
B OUT
CRT
SOCKET

14.4. C-Board Chassis (24” models)

C-Board main components


CRT SOCKET
C13
C12
C2
IC351

14.5. Q-Board Chassis (24” models)



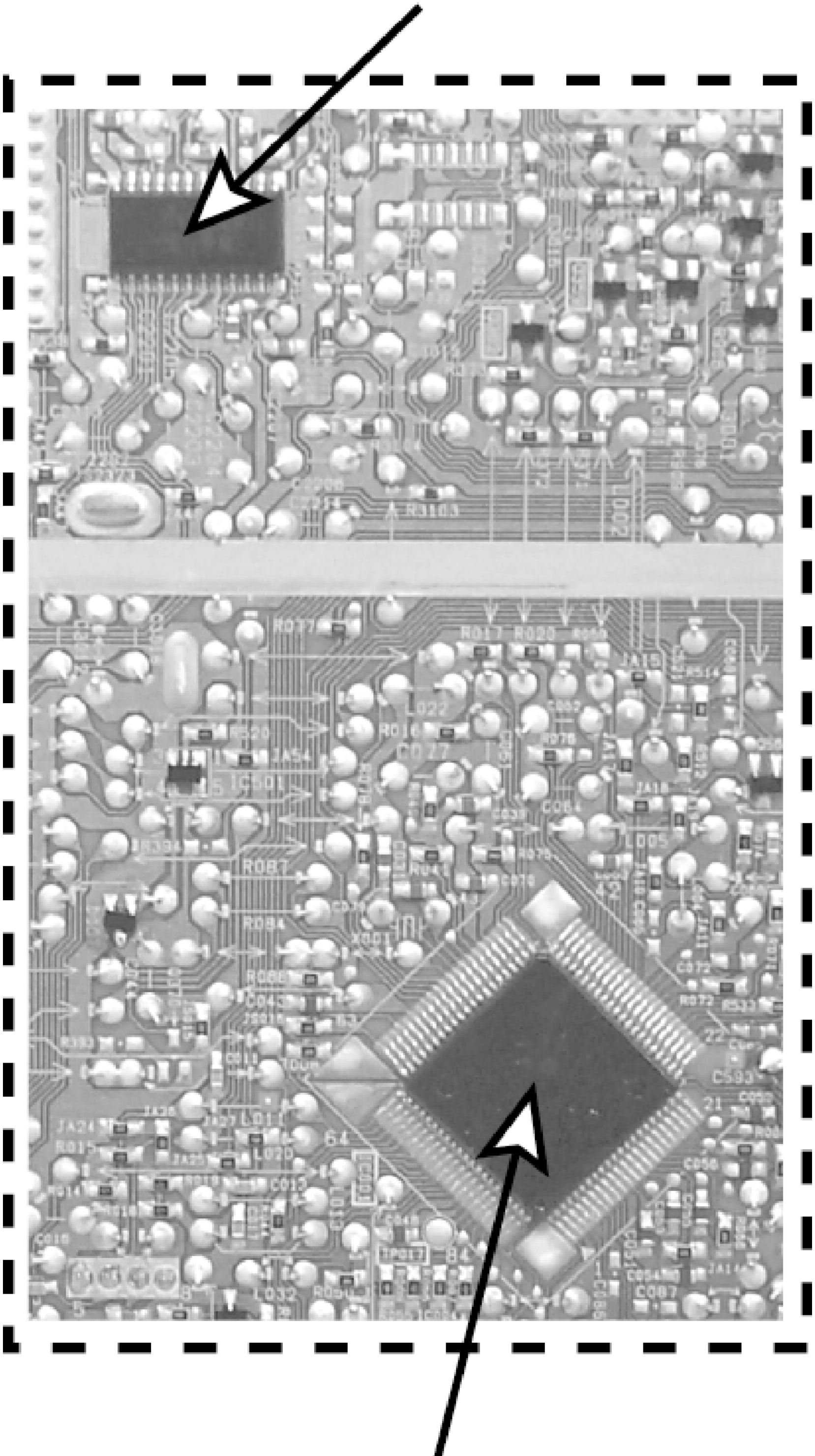
Q1 Connector

TNP2AA
ORDER NO
Q1
MK3169
C133
J842
C130
C132
L602
L600
TEAMX5
94V-0
L601

14.6. A-Board surface-mounted components

A-Board (bottom side)

IC2201



IC001

15. Reference for PDF colors

DESCRIPTION OF PDF LINK COLORS	
TYPE	**DESTINATION**
SCHEMATIC	
YELLOW ON IC	IC ON PCB
YELLOW ON CONNECTOR	CONNECTOR ON PCB
YELLOW ON SCHEMATIC	PCB
CYAN	WAVEFORM
GREEN ON SIDE	SCHEMATIC CONTINUED
GREEN ON CONNECTOR	CONNECTOR CONNECTION
BLUE ON IC	VOLTAGE
PCB	
BLUE ON IC	IC ON SCHEMATIC
BLUE ON CONNECTOR	CONNECTOR ON SCHEMATIC
BLUE ON PCB	SCHEMATIC
GREEN ON SIDE	PCB CONTINUED
BLOCK DIAGRAMS	
GREEN ON IC	IC ON SCHEMATIC
GREEN ON SIDE	BLOCK DIAGRAM CONTINUED

16. Conductor views

16.1. A-Board printed circuit (left side)

16.2. A-Board& C-Board printed circuit (right side)

16.3. C-Board printed Circuit (24” models)

16.4. Q-Board printed circuit (24” models)

17. Block diagrams

17.1. Video signal block diagram

17.2. Audio signal block diagram

18. Schematics

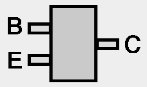
18.1. English schematic notes

Notes:

IMPORTANT SAFETY NOTICE

THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES THAT ARE IMPORTANT FOR PROTECTION FROM X-RADIATION, FIRE AND ELECTRICAL SHOCK HAZARDS. WHEN SERVICING IT IS ESSENTIAL THAT ONLY MANUFACTURERS SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS DESIGNATED WITH A ⚠ IN THE SCHEMATIC.

CHIP TRANSISTOR LEAD DESIGNATION



SCHEMATIC NOTES

1. Resistors are carbon 1/4W unless noted otherwise.
2. Capacitors are ceramic 50V unless noted otherwise.
3. Coil value notes is inductance in µH.
4. Test point indicated by ⍿ ; Test point but no pin ⍿.
5. Components indicated with ⚠ are critical parts and replacement should be made with manufacture specified replacement parts only.
6. ▬ (**BOLD LINE**) indicates the route of B+ supply.
7. The schematic diagrams are current at the time of printing and are subject to change without notice.
8. Ground symbol ⏚ indicates **HOT GROUND CONNECTION**; ⏚ indicates COLD GROUND.

NOTE: All other component symbols are used for engineering design purposes.

VOLTAGE MEASUREMENTS

1. Voltage measurement:
    - AC input to the Receiver is 120V. NTSC (HD, 1125i & 525P when applicable) signal generator is connected to the antenna of the Receiver. (Color bar pattern of 100 IRE white and 7.5 IRE black.)
    - All Picture and Audio adjustments are set to Normalize.
      TV ANT/CABLE - (Set-Up Menu) in TV/ANT Mode
      Volume - Min.
      TV/Video SW - TV position
      Audio Mode - Stereo
    - Voltage readings are nominal and may vary ±10% on active devices. Some voltage reading will vary with signal strength and picture content.
    - Supply voltages are nominal.
2. Ground symbol ⏚ indicates ground lead connection of meter.
   Incorrect ground connection will result in erroneous readings.

CAUTION: ***Incorrect ground connection of the test equipment will result in erroneous readings.***

WAVEFORM MEASUREMENTS

1. ③ indicates waveform measurement. (Measurement can be taken at the best accessible location in common to the indicated point.)
2. Taken with an NTSC signal generator connected to the antenna terminal. (NTSC color bar pattern of 8 bars of EIA colors, 100 IRE white and 7.5 IRE black.)
3. Customer Controls (Picture/Audio Menu) are set to Normalize. Volume is set to "MIN".
4. All video and color waveforms are taken with a wideband scope and a probe with low capacitance (10 to 1). Shape and peak altitudes may vary depending on the type of Oscilloscope used and its settings.
5. Ground symbol ⏚ shown on waveform number indicates (Hot) ground lead connection of the Oscilloscope.

CAUTION: Incorrect ground connection of the test equipment will result in erroneous readings.

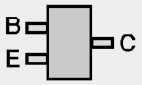
18.2. Notas de esquemáticos en español

Notas

NOTA DE SEGURIDAD

LOS DIAGRAMAS ELÉCTRICOS INCLUYEN CARACTERÍSTICAS ESPECIALES MUY IMPORTANTES PARA LA PROTECCIÓN CONTRA RAYOS-X, QUEMADURAS Y DESCARGAS ELÉCTRICAS. CUANDO SE DE SERVICIO ES IMPORTANTE USAR PARA REEMPLAZO DE COMPONENTES CRITICOS, SOLO PARTES ESPECIFICADAS POR EL FABRICANTES. LOS COMPONENTES CRITICOS ESTAN SEÑALADOS EN LOS DIAGRAMAS POR EL SIMBOLO ⚠.

IDENTIFICACIÓN DE TERMINALES PARA TRANSISTORES EN *CHIP*



NOTAS DE LOS DIAGRAMAS

1. Las Resistencias son de Carbón de 1/4W, a menos que se indique otra característica.
2. Los Capacitores son de Cerámica para 50V, a menos que se indique otra característica.
3. El valor indicado de las Bobinas es la inductancia expresada en µH.
4. Los puntos de prueba en la terminal de algún componente son indicados por ⚲ Los puntos de prueba fuera de los componentes se indican con ⚲.
5. Los componentes señalados con el símbolo ⚠ son considerados componentes críticos y deben ser reemplazados sólo con las partes especificadas por el fabricante.
6. ▬ (**LINEA GRUESA**) indica las líneas de alimentación de los Voltajes B+.
7. Los diagramas eléctricos están sujetos a cambio sin previo aviso.
8. El símbolo ⏚ indica que es una conexión a **Tierra Caliente** y el símbolo ⏊ indica conexión a **Tierra Fría**.

NOTA: Los demas símbolos de componentes incluidos son usados con fines de diseño.

MEDICIÓN DE VOLTAJES

1. Medición de voltaje:
   - El voltaje de entrada al Receptor es de 120V de Corriente Alterna. Un generador de patrones con formato NTSC se conecta a la entrada de la antena. (Patrón de Barras de Colores con 100 IREs para el Blanco y 7.5 IREs para el Negro.)
   - Los ajustes de los Menus Picture y Audio se normalizan.
     En el Menú Set-Up, en la opción ANTENA, se selecciona el modo de CABLE.
     El nivel de Volumen se minimiza.
     De los modos TV y Video, seleccionar el modo TV.
     Seleccionar modo Estereo del Audio.
   - Las mediciones de los voltajes son nominales y pueden variar hasta 10% en componentes en funcionamiento. Las lecturas de los voltajes pueden variar por la potencia de la señal y el contenido de la imagen.
   - Las fuentes de voltajes son nominales.
2. El símbolo ⏚ indica el tipo de tierra que se utiliza en la conexión del medidor.

PRECAUCION: Si no se utiliza la conexión a la tierra adecuada, se obtendrán mediciones equivocadas y podría dañar el equipo de medición.

MEDICIÓN DE FORMAS DE ONDA

1. Un símbolo como ③ indica el punto para medir una señal. (La medición puede hacerse en el punto con mayor accesibilidad, siempre que sea común al indicado.)
2. Se midieron utilizando un generador con formato NTSC conectado a la terminal de la antena. (Patrón de 8 Barras de Colores EAI, formato NTSC de 100 IREs para el Blanco y 7.5 IREs para el Negro.)
3. Los ajustes de usuario de los Menus PICTURE y AUDIO se normalizaron. Posteriormente el nivel de volumen se ajusta al mínimo.
4. Las formas de onda de Video y Color fueron tomadas con un osciloscopio de banda alta y con un punta de prueba de baja capacitancia (10 a 1). La forma y amplitud de las ondas puede variar según el tipo de osciloscopio que se utilice y sus características.
5. El símbolo de tierra ⏚ que aparece junto al número de la forma de onda, indica que se utiliza conexión a **Tierra Caliente** en el extremo negativo de la punta de prueba.

PRECAUCION: Si no se utiliza la conexión a la tierra adecuada, se obtendrán mediciones equivocadas y podría dañar el equipo de medición.

18.3. A-Board schematic TNP2AH047CD (page 1 of 4)

18.4. A-Board schematic TNP2AH047CD (page 2 of 4)

18.5. A-Board schematic TNP2AH047CD (page 3 of 4)

18.6. A-Board schematic TNP2AH047CD (page 4 of 4)

18.7. A-Board schematic TNP2AH047DB (page 1 of 4)

18.8. A-Board schematic TNP2AH047DB (page 2 of 4)

18.9. A-Board schematic TNP2AH047DB (page 3 of 4)

18.10. A-Board schematic TNP2AH047DB (page 4 of 4)

18.11. C-Board schematic TNP2AA122CB

18.12. C-Board schematic TNP2AA157AH (page 1 of 2)

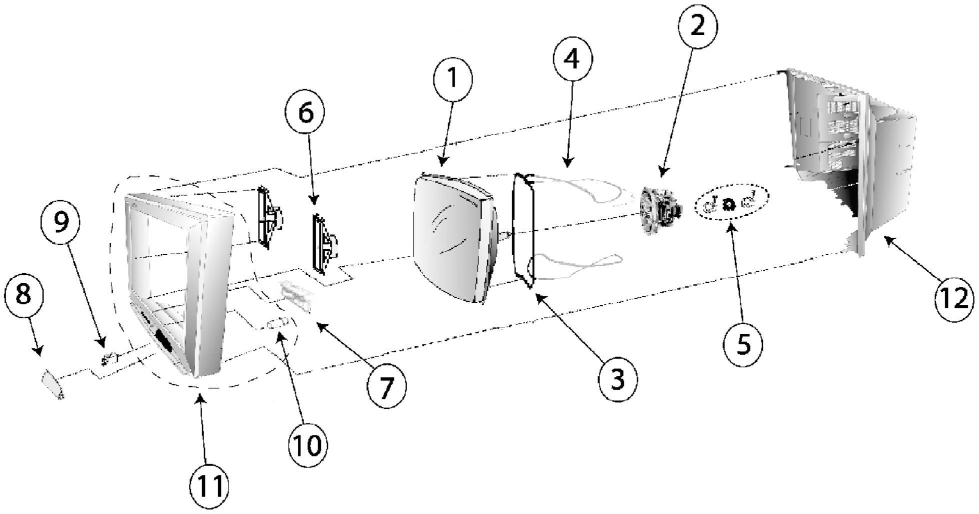
18.13. C-Board schematic TNP2AA157AH (page 2 of 2)

18.14. Q-Board schematic TNP2AA152

18.15. Voltages

18.16. Waveforms

19. Parts location



20. Parts list

20.1. Parts list notes

Important Safety Notice

Components identified by ⚠ mark have special characteristics important for safety.
When replacing any of these components, use manufacturer's specified parts.

Abbreviation of part name and description

1. Resistor
Example :
ERD25TJ104 **C** 100KΩ, **J**, 1/4W
Type Allowance

2. Capacitor
Example :
ECKF1H103ZF **C** 0.01µF, **Z**, 50V
Type Allowance

Type	Allowance
C : Carbon	F : ± 1%
F : Fuse	G : ± 2%
M : Metal Oxide Metal Film	J : ± 5% K : ± 10%
S : Solid	M : ± 20%
W : Wire Wound	

Type	Allowance
C : Carbon	C : ± 0.25pF
E : Electrolytic	D : ± 0.5pF
P : Polyester Polypropylene	F : ± 1pF G : ± 3%
T : Tantalum	J : ± 5%
	K : ± 10%
	L : ± 15%
	M : ± 20%
	P : ± 100%, -0%
	Z : ± 80%, -20%

20.2. Parts list

Ref. No.	Part No.	Part Name & Description	Remarks
		CAPRISTORS	
CRA801	**TP00842-51**	**TAPING GAP TERMINAL**	⚠
		CAPACITORS	
C003	**ECA1HM4R7B**	**CAP E 4.7UF-50V**	
C004	**TCJ2VC1H150J**	**CAP C 15PF-J-50V**	
C005	**TCJ2VC1H150J**	**CAP C 15PF-J-50V**	
C008	**TCJ2VF1H103Z**	**CAP C .01UF-Z-50V**	
C009	**ECJ2VB1C104K**	**CAP C .1UF-K-16V**	
C010	**TCJ2VC1H680J**	**CAP C 68PF-J-50V**	
C011	**TCJ2VC1H680J**	**CAP C 68PF-J-50V**	
C012	**ECA1HM0R1B**	**CAP E 0.1UF/50V**	
C013	**TCJ2VC1H680J**	**CAP C 68PF-J-50V**	
C016	**ECA1AM101B**	**CAP E 100UF-10V**	
C017	**TCJ2VC1H680J**	**CAP C 68PF-J-50V**	
C018	**TCJ2VF1H103Z**	**CAP C .01UF-Z-50V**	
C019	**ECA0JM102B**	**CAP E 1000UF-6.3V**	
C020	**ECA1CM102B**	**CAP E 1000UF/16V**	
C021	**TCJ2VF1H103Z**	**CAP C .01UF-Z-50V**	
C031	**TCJ2VC1H220J**	**CAP C 22PF-J-50V**	
C032	**ECA1AM470B**	**CAP E 47UF-10V**	
C034	**TCJ2VC1H390J**	**CAP C 39PF-J-50V**	
C035	**TCJ2VC1H120J**	**CAP C 12PF-J-50V**	
C038	**ECA1CM470B**	**CAP E 47UF/16V**	

Ref. No.	Part No.	Part Name & Description	Remarks
C039	TCJ2VB1H221K	CAP C 220PF-K-50V	
C041	ECA1HM2R2B	CAP E 2.2UF-50V	
C043	ECJ2VF1C105Z	CAP C 1.0UF-Z-16V	
C044	ECA0JM102B	CAP E 1000UF-6.3V	
C046	TCJ2VF1H103Z	CAP C .01UF-Z-50V	
C048	ECJ2VF1C105Z	CAP C 1.0UF-Z-16V	
C051	ECJ2VF1C105Z	CAP C 1.0UF-Z-16V	
C052	ECA1CM101B	CAP E 100UF/16V	
C053	ECJ2VF1C105Z	CAP C 1.0UF-Z-16V	
C054	ECJ2VF1C105Z	CAP C 1.0UF-Z-16V	
C055	ECJ2VF1C105Z	CAP C 1.0UF-Z-16V	
C056	ECJ2VF1C105Z	CAP C 1.0UF-Z-16V	
C057	ECEA1CN100UB	CAP E 10UF-16V	
C058	ECEA1CN100UB	CAP E 10UF-16V	
C059	ECJ2VF1C105Z	CAP C 1.0UF-Z-16V	
C060	ECEA1CN220UB	CAP E 22UF-16V	
C061	ECA1HM100B	CAP E 10UF/50V	
C062	ECA1HM100B	CAP E 10UF/50V	
C063	ECJ2VF1C104Z	CAP C .1UF-Z-16V	
C064	ECA1CM101B	CAP E 100UF/16V	
C066	TCJ2VC1H330J	CAP C 33PF-J-50V	
C067	TCJ2VC1H680J	CAP C 68PF-J-50V	
C068	ECA1CM100B	CAP E 10UF-16V	
C070	ECJ2VF1C104Z	CAP C .1UF-Z-16V	
C071	TCJ2VF1H103Z	CAP C .01UF-Z-50V	
C072	TCJ2VB1H221K	CAP C 220PF-K-50V	
C073	TCJ2VC1H101J	CAP C 100PF-J-50V	
C077	ECA1HM100B	CAP E 10UF/50V	
C079	TCJ2VC1H220J	CAP C 22PF-J-50V	
C083	TCJ2VF1H103Z	CAP C .01UF-Z-50V	
C085	ECJ2VB1C104K	CAP C .1UF-K-16V	
C130	ECWF2684JSR	CAP M .26UF-J-200V / CT-24SL13G CT-24SL13UG	⚠
C131	ECQE2474KFW	CAP P .47UF-K-200V / CT-24SL13G CT-24SL13UG	
C132	ECWF2754JBB	CAP M .27UF-J-200V / CT-24SL13G CT-24SL13UG	⚠
C133	ECWF2684JSR	CAP M .26UF-J-200V / CT-24SL13G CT-24SL13UG	
C350	ECA1CM101B	CAP E 100UF/16V / CT-20SL13G	
C351	TACCV470T50V	CAP C 47PF/50V / CT-24SL13G CT-24SL13UG	
C351	TCJ2VB1H151K	CAP C 150PF-K-50V / CT-20SL13G	
C352	TACCV330T50V	CAP C 33PF/50V / CT-24SL13G CT-24SL13UG	
C352	TCJ2VB1H151K	CAP C 150PF-K-50V / CT-20SL13G	
C353	TACCV330T50V	CAP C 33PF/50V / CT-24SL13G CT-24SL13UG	
C353	TCJ2VB1H151K	CAP C 150PF-K-50V / CT-20SL13G	
C354	ECKW3D102KBN	CAP C .001UF-K-2KVDC / CT-20SL13G	
C357	EEANA1E1R0B	CAP E 1.0UF-25V / CT-20SL13G	
C359	ECA1CM471B	CAP E 470UF-16V	
C359	ECQM4104KZB	CAP P .10UF-K-400V / CT-24SL13G CT-24SL13UG	
C360	ECA1HM4R7B	CAP E 4.7UF-50V	
C368	ECQV1H224JL3	CAP P .22UF-J-50V / CT-24SL13G CT-24SL13UG	
C370	ECKW3D102KBN	CAP C .001UF-K-2KVDC / CT-24SL13G CT-24SL13UG	
C371	ECEA1HN010UB	CAP E 1UF/50V / CT-24SL13G CT-24SL13UG	
C373	ECA2EM470E	CAP E 47UF-250V / CT-24SL13G CT-24SL13UG	
C403	ECEA1CN220UB	CAP E 22UF-16V	
C411	ECQB1H683JF3	CAP P .068UF-J-50V	

Ref. No.	Part No.	Part Name & Description	Remarks
C451	ECA1HM2R2B	CAP E 2.2UF-50V	
C452	ECA1CM220B	CAP E 22UF-16V	
C454	ECA1VHG101B	CAP E 100UF-35V	
C455	ECA1EM102E	CAP E 1000UF-25V	
C458	ECA1HM010B	CAP E 1UF-50V	
C459	ECA1VHG471E	CAP E 470UF-35V	
C460	ECQB1224KF3	CAP P .22UF-K-100V	
C461	ECQB1104JF3	CAP P .10UF-J-100V	
C462	ECJ2VF1H103Z	CAP C .01UF-Z-50V / CT-20SL13G	
C462	TCJ2VF1H103Z	CAP C .01UF-Z-50V / CT-24SL13G CT-24SL13UG	
C501	ECCR1H221JC5	CAP C 220PF-J-50V	
C505	ECQB1H104JF3	CAP P .10UF-J-50V	
C506	ECKR2H102KB5	CAP C 1000PF-K-500V	
C510	ECCR2H100D5	CAP C 10PF-D-500V	
C512	ECA2CM100B	CAP E 10UF-160V / CT-20SL13G	
C512	ECA2CM100M	CAP E 10UF-160V / CT-24SL13G CT-24SL13UG	
C531	ECA1HM4R7B	CAP E 4.7UF-50V	⚠
C540	TCJ2VF1H103Z	CAP C .01UF-Z-50V	
C551	ECA1VHG471B	CAP E 470UF-35V	⚠
C554	ECKR2H561KB5	CAP C 560PF-K-500V	
C555	ECA2EM220E	CAP E 22UF-250V	⚠
C556	ECA1CM471B	CAP E 470UF-16V	⚠
C557	ECKR2H102KB5	CAP C 1000PF-K-500V / CT-24SL13G CT-24SL13UG	
C557	ECKR2H222KB5	CAP C 2200PF-K-500V / CT-20SL13G	
C560	ECQB1104JFW	CAP P .10UF-J-1KV	
C561	ECEA1HN010UB	CAP E 1UF/50V	
C562	ECKR2H561KB5	CAP C 560PF-K-500V	
C563	ECWH20113JVB	CAP P .011UF-J-200V / CT-24SL13G CT-24SL13UG	
C563	ECWH20752JVB	CAP P 7500PF-J-200V / CT-20SL13G	⚠
C564	ECKW3D102JBR	CAP C 1000PF-J-2KV / CT-20SL13G	⚠
C564	ECWH20362JVB	CAP P 3600PF-J-200V / CT-24SL13G CT-24SL13UG	⚠
C565	ECKW3D471JBR	CAP C 470PF-J-2KV / CT-20SL13G	⚠
C565	ECKW3D681JBP	CAP C 680PF-J-2KV / CT-24SL13G CT-24SL13UG	
C566	ECKW3D181JBP	CAP C 180PF-J-2KV	⚠
C568	ECQM4183JZW	CAP P .018UF-J-2KV / CT-24SL13G CT-24SL13UG	⚠
C568	ECQM4333JZW	CAP P .033UF-J-400V / CT-20SL13G	⚠
C569	ECWF2304JSR	CAP P .30UF-J-200V / CT-20SL13G	
C570	ECA1CM221B	CAP E 10UF-16V	
C571	ECA1CM220B	CAP E 22UF-16V	
C572	ECA0JM221B	CAP E 220UF-6.3V	
C573	ECA1CM101B	CAP E 100UF/16V	
C575	ECKR2H471KB5	CAP C 470PF-K-500V	
C593	ECA1CM470B	CAP E 47UF/16V	
C605	TCJ2VF1H103Z	CAP C .01UF-Z-50V	
C606	ECA0JM221B	CAP E 220UF-6.3V	
C756	ECKW2H682KB5	CAP C 6800PF-K-500V / CT-24SL13G CT-24SL13UG	
C759	ECQE1395KNB	CAP P 3.95UF-K-100V / CT-24SL13G CT-24SL13UG	⚠
C760	ECA2CM330E	CAP E 33UF-160V / CT-24SL13G CT-24SL13UG	⚠
C763	ECKR3A121KBP	CAP C 120PF-K-1KV / CT-24SL13G CT-24SL13UG	
C800	ECKR3A152KBP	CAP C 1500PF-K-1KVDC	

Ref. No.	Part No.	Part Name & Description	Remarks
C801	ECKWAE472ZED	CAP C 4700PF-Z-500V	⚠
C802	ECKWAE472ZED	CAP C 4700PF-Z-500V	⚠
C803	ECKWAE472ZED	CAP C 4700PF-Z-500V	⚠
C805	EC0S2DA221BB	CAP E 220UF/200V / CT-20SL13G	⚠
C805	EC0S2DA471BB	CAP E 470UF/160V / CT-24SL13G CT-24SL13UG	⚠
C806	ECQM4103KZW	CAP P .01UF-K-400V	
C808	ECA1HM470B	CAP E 47UF-50V	
C809	ECKR1H102KB5	CAP C .001UF-K-50V	
C810	ECKR1H471KB5	CAP C 470PF-K-50V	
C812	ECQU2A224MVA	CAP P .22UF-M-250VAC	⚠
C813	ECQU2A153MVA	CAP P .015UF-M-250VAC	⚠
C814	ECQU2A153MVA	CAP P .015UF-M-250VAC	⚠
C820	ECA1CM101B	CAP E 100UF/16V	
C821	TCJ2VF1H103Z	CAP C .01UF-Z-50V	
C822	ECKR3A221KBP	CAP C 220PF-K-1KV	
C823	ECA1VM471E	CAP E 470UF-35V	⚠
C824	ECKR3A102KBP	CAP C 1000PF-K-1KV	
C825	EEUMG2C221S	CAP E 220UF-160V	⚠
C826	ECKR3A471KBP	CAP C 470PF-K-1KV	
C827	ECA1CM102B	CAP E 1000UF/16V	
C828	ECA160V33UE	CAP E 33UF/160V	⚠
C829	ECA1CM471B	CAP E 470UF-16V	
C830	ECA1CM471B	CAP E 470UF-16V	
C901	ECJ2VB1H103K	CAP C .01UF-K-50V / CT-24SL13G CT-24SL13UG	
C904	ECKR1H103ZF5	CAP C .01UF-Z-50V / CT-24SL13G CT-24SL13UG	
C952	ECA1HM100B	CAP E 10UF/50V / CT-24SL13G CT-24SL13UG	
C953	ECKR1H103ZF5	CAP C .01UF-Z-50V / CT-24SL13G CT-24SL13UG	
C958	ECA2CM470E	CAP E 47UF-160V / CT-24SL13G CT-24SL13UG	
C959	ECKW2H103ZF7	CAP C .01UF-Z-500V / CT-24SL13G CT-24SL13UG	
C960	ECCR2H151J5	CAP C 150-500V / CT-24SL13G CT-24SL13UG	
C961	ECA2AM100B	CAP E 10UF-100V / CT-24SL13G CT-24SL13UG	
C962	ECKW2H103ZF7	CAP C .01UF-Z-500V / CT-24SL13G CT-24SL13UG	
C963	ECCR1H151J5	CAP DISC 150-5-50V / CT-24SL13G CT-24SL13UG	
C964	ECA1CHG101B	CAP E 100UF-16V / CT-24SL13G CT-24SL13UG	
C966	ECA1CHG101B	CAP E 100UF-16V / CT-24SL13G CT-24SL13UG	
C967	ECA1CM221B	CAP E 10UF-16V / CT-24SL13G CT-24SL13UG	
C968	ECKR1H103ZF5	CAP C .01UF-Z-50V / CT-24SL13G CT-24SL13UG	
C969	ECKR1H103ZF5	CAP C .01UF-Z-50V / CT-24SL13G CT-24SL13UG	
C971	TACCW222T50V	CAP C 2200PF/50V / CT-24SL13G CT-24SL13UG	
C2201	ECA1HM4R7B	CAP E 4.7UF-50V	
C2202	ECA1HM2R2B	CAP E 2.2UF-50V	
C2203	ECA1HM4R7B	CAP E 4.7UF-50V	
C2204	AP106K016CAE	CAP T 10UF/16V	
C2205	ECA1HMR33B	CAP E .33UF-50V	
C2206	ECQB1H223JF3	CAP P .022UF-J-50V	
C2207	AP335K016CAE	CAP T 3.3UF/16V	
C2208	ECJ2VB1C104K	CAP C .1UF-K-16V	
C2209	ECJ2VB1C104K	CAP C .1UF-K-16V	
C2210	ECJ2VB1C104K	CAP C .1UF-K-16V	
C2212	ECQB1H473JF3	CAP P .047UF-J-50V	

Ref. No.	Part No.	Part Name & Description	Remarks
C2213	ECA1HMR47B	CAP E .47UF-50V	
C2214	ECA1AM101B	CAP E 100UF-10V	
C2215	EEANA1E100B	CAP E 10UF-25V	
C2216	TCJ2VC1H100D	CAP C 10PF-J-50V	
C2217	ECJ2VB1H102K	CAP C .001UF-K-50V	
C2217	TCJ2VB1H102K	CAP C 1000PF-K-50V	
C2218	ECJ2VB1H102K	CAP C .001UF-K-50V	
C2218	TCJ2VB1H102K	CAP C 1000PF-K-50V	
C2219	ECJ2VF1C105Z	CAP C 1.0UF-Z-16V	
C2220	ECJ2VF1C105Z	CAP C 1.0UF-Z-16V	
C2301	ECA1EM102E	CAP E 1000UF-25V	
C2302	ECA1HM010B	CAP E 1UF-50V	
C2304	ECA1CM101B	CAP E 100UF/16V	
C2307	ECA1CM102B	CAP E 1000UF/16V	
C2308	ECKR1H103ZF5	CAP C .01UF-Z-50V	
C2309	ECA1HM010B	CAP E 1UF-50V	
C2312	ECA1HM010B	CAP E 1UF-50V	
C2313	ECA1EM220B	CAP E 22UF-25V	
C2317	ECA1CM102B	CAP E 1000UF/16V	
C2319	ECA1HM010B	CAP E 1UF-50V	
C2350	ECA1CM101B	CAP E 100UF/16V	
C2501	TCJ2VB1H332K	CAP C .0033UF-K-50V	
C2502	TCJ2VB1H332K	CAP C .0033UF-K-50V	
C2503	TCJ2VB1H333K	CAP C .033UF-K-50V	
C2504	TCJ2VB1H333K	CAP C .033UF-K-50V	
C2505	EEANA1E4R7B	CAP E 4.7UF-25V	
C2506	EEANA1E4R7B	CAP E 4.7UF-25V	
C2507	TCJ2VB1H472K	CAP C 4700PF-K-50V	
C2508	TCJ2VB1H472K	CAP C 4700PF-K-50V	
C2509	ECJ2VB1C104K	CAP C .1UF-K-16V	
C2510	ECJ2VB1C104K	CAP C .1UF-K-16V	
C2511	ECA1HM010B	CAP E 1UF-50V	
C2512	ECJ2VB1C104K	CAP C .1UF-K-16V	
C2513	ECA1HM4R7B	CAP E 4.7UF-50V	
C2514	ECA1HM4R7B	CAP E 4.7UF-50V	
C2515	TCJ2VF1C105Z	CAP C 1.0UF-Z-16V	
C2516	ECA1HM4R7B	CAP E 4.7UF-50V	
C2517	ECA1HM4R7B	CAP E 4.7UF-50V	
C2518	ECA1HM4R7B	CAP E 4.7UF-50V	
C2519	ECA1CM220B	CAP E 22UF-16V / CT-24SL13G CT-24SL13UG	
C2519	ECA1CM470B	CAP E 47UF/16V / CT-20SL13G	
C2520	TCJ2VF1H103Z	CAP C .01UF-Z-50V	
C2531	ECA1HM4R7B	CAP E 4.7UF-50V	
C2532	ECA1HM4R7B	CAP E 4.7UF-50V	
C3001	ECA1CM220B	CAP E 22UF-16V	
C3002	ECA1CM220B	CAP E 22UF-16V	
C3011	ECJ2VF1C105Z	CAP C 1.0UF-Z-16V	
C3012	ECA1HM010B	CAP E 1UF-50V	
C3013	ECA1CM100B	CAP E 10UF-16V	
C3014	ECA1CM100B	CAP E 10UF-16V	
C3015	ECA1HM010B	CAP E 1UF-50V	
C3016	ECA1HM010B	CAP E 1UF-50V	
C3017	ECA1HM010B	CAP E 1UF-50V	
C3018	ECA1HM010B	CAP E 1UF-50V	

Ref. No.	Part No.	Part Name & Description	Remarks
C3019	ECJ2VF1C105Z	CAP C 1.0UF-Z-16V	
C3020	ECA1HM010B	CAP E 1UF-50V	
C3025	ECA1HM100B	CAP E 10UF/50V	
C3121	ECA1CM470B	CAP E 47UF/16V	
C3122	TCJ2VF1H103Z	CAP C .01UF-Z-50V	
C3234	ECA1CM470B	CAP E 47UF/16V	
C3240	TCJ2VF1H103Z	CAP C .01UF-Z-50V	
C4322	ECA1CM100B	CAP E 10UF-16V	
C4323	ECA1CM470B	CAP E 47UF/16V	
C4324	TCJ2VF1H103Z	CAP C .01UF-Z-50V	
C4325	ECA1CM100B	CAP E 10UF-16V	
DIODES			
D001	MAZ30680ML	DIODE ZENER	
D002	MA2C165001VT	DIODE	
D003	MAZ30510HL	DIODE	
D006	MAZ33000HL	DIODE	
D007	MAZ30510HL	DIODE	
D010	MAZ40510MF	DIODE ZENER	
D055	MAZ40330MF	DIODE ZENER	
D360	B0HAGP000003	DIODE / CT-24SL13G CT-24SL13UG	
D360	MA2C165001VT	DIODE	
D361	B0HAGP000003	DIODE / CT-24SL13G CT-24SL13UG	
D362	B0HAGP000003	DIODE / CT-24SL13G CT-24SL13UG	
D380	MA2C029WBF	DIODE	
D451	B0EAKL000008	DIODE RECTIFIER	
D452	MA2C165001VT	DIODE	
D505	D1NL40V70	DIODE	
D531	MA2C165001VT	DIODE	⚠
D551	B0HAMM000072	DIODE FAST RECOVERY	⚠
D554	AU02V0	DIODE	⚠
D556	MA2C165001VT	DIODE	
D557	MA4027LTA	DIODE	
D558	B0HANV000008	DIODE	
D559	EU2	DIODE	
D561	AU02V0	DIODE	⚠
D606	MA2C165001VT	DIODE	
D753	AU01ZV0	DIODE / CT-24SL13G CT-24SL13UG	
D801	D3SBA60-4103	DIODE	⚠
D803	MAZ41200MF	DIODE ZENER	
D806	TAP2AA0003	PTC 3-OHM	⚠
D808	SARS01V1	DIODE	
D809	B0HAJP000015	DIODE	
D810	B0HAJP000015	DIODE	
D811	B0HAJP000015	DIODE	
D820	MA2C165001VT	DIODE	
D821	MAZ40470HF	DIODE ZENER	
D822	B0HAMM000103	DIODE	
D823	S3L60P154004	DIODE	⚠
D824	B0HAMM000072	DIODE FAST RECOVERY	
D2302	MAZ43000MF	DIODE ZENER	
D2305	CVS20A120MTA	DIODE	
D2307	CVS20A120MTA	DIODE	

Ref. No.	Part No.	Part Name & Description	Remarks
D2350	MAZ40910LF	DIODE ZENER	
D2353	MA2C165001VT	DIODE	
D2355	MAZ30510HL	DIODE	
D2360	CVS20A120MTA	DIODE	
D2361	CVS20A120MTA	DIODE	
D2501	MAZ31100ML	DIODE ZENER	
D3001	MAZ40510MF	DIODE ZENER	
D3004	CVS20A120MTA	DIODE	
D3005	CVS20A120MTA	DIODE	
D3007	MAZ31100ML	DIODE ZENER	
D3008	MAZ31100ML	DIODE ZENER	
D3009	MAZ31100ML	DIODE ZENER	
D3010	MAZ31100ML	DIODE ZENER	
D3011	MAZ31100ML	DIODE ZENER	
D3012	MAZ31100ML	DIODE ZENER	
D3017	MAZ31100ML	DIODE ZENER	
D3018	MAZ31100ML	DIODE ZENER	
D3019	CVS20A120MTA	DIODE	
D3021	CVS20A120MTA	DIODE	
D3023	MAZ31100ML	DIODE ZENER	
D3024	MAZ31100ML	DIODE ZENER	
FUSES			
F801	XBA2A00101	FUSE 6.3A 125V	⚠
INTEGRATED CIRCUITS			
IC001	MN101E03GTB5	MPU	
IC002	TVR2AJ169S	EEPROM / CT-24SL13G CT-24SL13UG	
IC002	TVR2AJ171S	EEPROM / CT-20SL13G	
IC003	GP1UE282GK	IR SENSOR	
IC004	PST9128NR	RESET	
IC005	PQ3RD13	3.3V STBY REGULATOR	
IC351	C1AA00000622	RGB AMPLIFIER / CT-24SL13G CT-24SL13UG	
IC451	AN5522	VERTICAL OUTPUT AMPLIFIER	
IC501	NC7SZU04M5X	H-DRIVE INVERTER	
IC551	AN78M09LB	9V VOLTAGE REGULATOR	
IC552	AN78M05LB	5V VOLTAGE REGULATOR	
IC801	STRW5634	MAIN POWER SUPPLY	⚠
IC802	0N3171RLF	OPTO-COUPLER	⚠
IC2201	AN5829S-E1V	MTS	
IC2301	AN17807A	AUDIO AMPLIFIER	
IC2501	NJW1137MTE1	BBE PROCESSOR	
IC3001	MM1114XFBE	VIDEO SWITCH	
IC3002	MM1501XNRE	FRONT VIDEO SWITCH	
IC3101	74HC4066D653	AUDIO SWITCH	
COILS			
L002	EXCELSA39V	FERRITE BEAD	
L003	EXCELDR35V	FERRITE BEAD	
L005	EXCELSA35V	FERRITE BEAD	
L006	EXCELSA35T	FERRITE BEAD	
L007	ELESN330JA	COIL PEAKING 33UH	
L008	G0C470KA0029	COIL PEAKING 47UH	
L010	G0C2R2KA0029	COIL PEAKING 2.2UH	
L011	EXCELSA26T	FERRITE BEAD	
L012	G0C2R2KA0029	COIL PEAKING 2.2UH	

Ref. No.	Part No.	Part Name & Description	Remarks
L013	EXCELSA26T	FERRITE BEAD	
L014	ELESN180KA	COIL PEAKING 18UH	
L015	ELESN3R3JA	COIL PEAKING 3.3UH	
L020	EXCELSA26T	FERRITE BEAD	
L032	EXCELSA26T	FERRITE BEAD	
L108	EXCELSA35V	FERRITE BEAD	
L110	G0C101KA0021	COIL PEAKING 100UH	
L148	EXCELSA35T	FERRITE BEAD	
L245	EXCELSA35V	FERRITE BEAD	
L312	EXCELSA24T	FERRITE BEAD	
L551	ELH5L4115	COIL / CT-20SL13G	⚠
L551	ELH5L6108	COIL / CT-24SL13G CT-24SL13UG	⚠
L552	EXCELSA39V	FERRITE BEAD	
L600	ELC18B801E	COIL / CT-24SL13G CT-24SL13UG	
L601	ELC18B801E	COIL / CT-24SL13G CT-24SL13UG	
L602	TLUADNB682K	COIL / CT-24SL13G CT-24SL13UG	
L751	ELC18B301L	COIL CHOKE / CT-24SL13G CT-24SL13UG	
L752	TALL13N103JB	COIL / CT-24SL13G CT-24SL13UG	
L753	EXCELSA35T	FERRITE BEAD / CT-24SL13G CT-24SL13UG	
L801	ELF15N011A	COIL / CT-20SL13G	
L801	ELF21V020A	COIL / CT-24SL13G CT-24SL13UG	⚠
L802	ELEKE680KA	COIL PEAKING 68UH / CT-20SL13G	
L802	TALL08T470KA	COIL / CT-24SL13G CT-24SL13UG	
L803	TALL08T680KA	COIL	
L804	EXCELDR35V	FERRITE BEAD / CT-20SL13G	
L805	EXCELDR35V	FERRITE BEAD / CT-20SL13G	
L806	EXCELDR35V	FERRITE BEAD	
L807	EXCELSA35V	FERRITE BEAD	
L808	EXCELSA35V	FERRITE BEAD	
L809	EXCELDR35V	FERRITE BEAD / CT-24SL13G CT-24SL13UG	
L810	EXCELDR35V	FERRITE BEAD / CT-24SL13G CT-24SL13UG	
L951	EXCELSA24T	FERRITE BEAD / CT-24SL13G CT-24SL13UG	
L953	EXCELSA24T	FERRITE BEAD / CT-24SL13G CT-24SL13UG	
L954	EXCELSA24T	FERRITE BEAD / CT-24SL13G CT-24SL13UG	
L955	EXCELSA24T	FERRITE BEAD / CT-24SL13G CT-24SL13UG	
L2301	EXCELSA35T	FERRITE BEAD	
L2303	EXCELSA39V	FERRITE BEAD	
L2305	EXCELSA35V	FERRITE BEAD	
		TRANSISTORS	
Q001	2PD601AR-115	TRANSISTOR	
Q057	2PB709AR-115	TRANSISTOR	
Q058	2PB709AR-115	TRANSISTOR	
Q070	2PD601AR-115	TRANSISTOR	
Q092	2PB709AR-115	TRANSISTOR	
Q351	2SC3063RL	TRANSISTOR / CT-20SL13G	
Q352	2SC3063RL	TRANSISTOR / CT-20SL13G	
Q353	2SC3063RL	TRANSISTOR / CT-20SL13G	
Q354	2PD601AR-115	TRANSISTOR	
Q355	2PD601AR-115	TRANSISTOR	
Q356	2PD601AR-115	TRANSISTOR	
Q357	2PD601AR-115	TRANSISTOR	
Q358	2PD601AR-115	TRANSISTOR	
Q359	2PD601AR-115	TRANSISTOR	

Ref. No.	Part No.	Part Name & Description	Remarks
Q360	2PB709AR-115	TRANSISTOR	
Q361	2PB709AR-115	TRANSISTOR	
Q362	2PB709AR-115	TRANSISTOR	
Q411	2SB0710AQL	TRANSISTOR	
Q412	2SD0602AQL	TRANSISTOR	
Q451	2PB709AR-115	TRANSISTOR	
Q451	2SB709ARTX	TRANSISTOR / CT-20SL13G	
Q501	2SC1573AH	TRANSISTOR / CT-20SL13G	
Q501	2SC4212HLB	TRANSISTOR / CT-24SL13G CT-24SL13UG	
Q551	2SC562200VLK	TRANSISTOR / CT-20SL13G	
Q551	2SC5902000LK	TRANSISTOR / CT-24SL13G CT-24SL13UG	⚠
Q560	2PB709AR-115	TRANSISTOR	
Q605	2PB709AR-115	TRANSISTOR	
Q606	2PD601AR-115	TRANSISTOR	
Q751	B1DACM000001	TRANSISTOR / CT-24SL13G CT-24SL13UG	
Q757	2SC1685QRSTA	TRANSISTOR / CT-24SL13G CT-24SL13UG	
Q801	2PD601AR-115	TRANSISTOR	
Q802	2PD601AR-115	TRANSISTOR	
Q820	2SA1767QTA	TRANSISTOR	
Q830	2SB1011QRL	TRANSISTOR	
Q831	2SC1473ATA	TRANSISTOR	
Q901	2PD601AR-115	TRANSISTOR / CT-24SL13G CT-24SL13UG	
Q902	2PB709AR-115	TRANSISTOR / CT-24SL13G CT-24SL13UG	
Q951	2SC3311ATA	TRANSISTOR / CT-24SL13G CT-24SL13UG	
Q952	2SC3311ATA	TRANSISTOR / CT-24SL13G CT-24SL13UG	
Q953	2SC1741ASTP	TRANSISTOR / CT-24SL13G CT-24SL13UG	
Q954	2SB1030ATA	TRANSISTOR / CT-24SL13G CT-24SL13UG	
Q955	2SB1569AF51E	TRANSISTOR / CT-24SL13G CT-24SL13UG	
Q956	2SD2400AF51E	TRANSISTOR / CT-24SL13G CT-24SL13UG	
Q957	2SA1309ATA	TRANSISTOR / CT-24SL13G CT-24SL13UG	
Q958	2SC3311ATA	TRANSISTOR / CT-24SL13G CT-24SL13UG	
Q961	2SC3311ATA	TRANSISTOR / CT-24SL13G CT-24SL13UG	
Q962	2SC3311ATA	TRANSISTOR / CT-24SL13G CT-24SL13UG	
Q2350	2PB709AR-115	TRANSISTOR	
Q2361	2PD601AR-115	TRANSISTOR	
Q2362	2PD601AR-115	TRANSISTOR	
Q2363	2PB709AR-115	TRANSISTOR	
Q3001	2PD601AR-115	TRANSISTOR	
Q3002	2PD601AR-115	TRANSISTOR	
Q3193	2PD601AR-115	TRANSISTOR	
Q3194	2PD601AR-115	TRANSISTOR	
RELAYS			
RL801	K6B1AGA00042	RELAY	⚠
RESISTORS			
R001	ERJ6GEYJ103V	RES M 10K-J-1/10W	
R004	ERJ6GEYJ562V	RES M 5.6K-J-1/10W	
R005	ERJ6GEYJ471V	RES M 470-J-1/10W	
R007	ERJ6GEYJ471V	RES M 470-J-1/10W	
R008	ERJ6GEYJ223V	RES M 22K-J-1/10W	
R009	ERJ6GEYJ102V	RES M 1K-J-1/10W	
R014	ERJ6GEYJ472V	RES M 4.7K-J-1/10W	
R015	ERJ6GEYJ472V	RES M 4.7K-J-1/10W	
R016	ERJ6GEYJ221V	RES M 220-J-1/10W	

Ref. No.	Part No.	Part Name & Description	Remarks
R017	ERJ6GEYJ221V	RES M 220-J-1/10W	
R018	ERJ6GEYJ472V	RES M 4.7K-J-1/10W	
R019	ERJ6GEYJ472V	RES M 4.7K-J-1/10W	
R020	ERJ6GEYJ221V	RES M 220-J-1/10W	
R021	ERJ6GEYJ101V	RES M 100-J-1/10W	
R022	ERJ6GEYJ101V	RES M 100-J-1/10W	
R023	ERJ6GEYJ102V	RES M 1K-J-1/10W	
R024	ERJ6GEYJ101V	RES M 100-J-1/10W	
R025	ERJ6GEYJ101V	RES M 100-J-1/10W	
R026	ERDS1FJ561P	RES C 560-J-1/2W	
R032	ERJ6GEYJ103V	RES M 10K-J-1/10W	
R033	ERJ6GEYJ222V	RES M 2.2K-J-1/10W	
R034	ERJ6GEYJ222V	RES M 2.2K-J-1/10W	
R035	ERJ6GEYJ332V	RES M 3.3K-J-1/10W	
R036	ERJ6GEYJ512V	RES M 5.1K-J-1/10W	
R037	ERJ6GEYJ912V	RES M 9.1K-J-1/10W	
R038	ERJ6GEYJ223V	RES M 22K-J-1/10W	
R039	ERDS2TJ102T	RES C 1K-J-1/4W	
R040	ERJ6GEYJ680V	RES M 68-J-1/10W	
R041	ERJ6GEYJ222V	RES M 2.2K-J-1/10W	
R042	ERJ6GEYJ222V	RES M 2.2K-J-1/10W	
R043	ERJ6GEYJ153V	RES M 15K-J-1/10W	
R044	ERJ6GEYJ101V	RES M 100-J-1/10W	
R045	ERDS2TJ101T	RES C 100-J-1/4W	
R046	ERJ6GEYJ102V	RES M 1K-J-1/10W	
R047	ERJ6GEYJ472V	RES M 4.7K-J-1/10W	
R048	ERJ6GEYJ101V	RES M 100-J-1/10W	
R050	ERJ6GEYJ102V	RES M 1K-J-1/10W	
R052	ERJ6GEYJ103V	RES M 10K-J-1/10W	
R053	ERJ6GEYJ101V	RES M 100-J-1/10W	
R055	ERJ6GEYJ103V	RES M 10K-J-1/10W	
R056	ERJ6GEYJ471V	RES M 470-J-1/10W	
R057	ERJ6GEYJ101V	RES M 100-J-1/10W	
R059	ERJ6GEYJ121V	RES M 120-J-1/10W / CT-24SL13G CT-24SL13UG	
R060	ERJ6GEYJ101V	RES M 100-J-1/10W	
R061	ERJ6GEYJ221V	RES M 220-J-1/10W	
R062	ERJ6GEYJ472V	RES M 4.7K-J-1/10W	
R063	ERDS2TJ101T	RES C 100-J-1/4W	
R064	ERJ6GEYJ473V	RES M 47K-J-1/10W	
R065	ERDS2TJ101T	RES C 100-J-1/4W	
R066	ERJ6GEYJ223V	RES M 22K-J-1/10W	
R067	ERJ6GEYJ223V	RES M 22K-J-1/10W	
R068	ERJ6GEYJ103V	RES M 10K-J-1/10W	
R069	ERJ6GEYJ123V	RES M 12K-J-1/10W	
R070	ERJ6GEYJ561V	RES M 560-J-1/10W	
R071	ERJ6GEYJ680V	RES M 68-J-1/10W	
R072	ERJ6GEYJ222V	RES M 2.2K-J-1/10W	
R073	ERJ6GEYJ471V	RES M 470-J-1/10W	
R074	ERJ6GEYJ471V	RES M 470-J-1/10W	
R075	ERJ6ENF3902V	RES M 39K-F-1/10W	
R076	ERJ6ENF6201V	RES M 6.2K-F-1/10W	
R077	ERJ6GEYJ103V	RES M 10K-J-1/10W	
R078	ERJ6GEYJ103V	RES M 10K-J-1/10W	
R080	ERJ6GEYJ183V	RES M 18K-J-1/10W	

Ref. No.	Part No.	Part Name & Description	Remarks
R081	ERJ6GEYJ153V	RES M 15K-J-1/10W	
R082	ERJ6GEYJ183V	RES M 18K-J-1/10W	
R083	ERJ6GEYJ153V	RES M 15K-J-1/10W	
R084	ERDS2TJ182T	RES C 1.8K-J-1/4W	
R087	ERDS2TJ221T	RES C 220-J-1/4W	
R088	ERJ6GEYJ223V	RES M 22K-J-1/10W	
R092	ERJ6GEYJ473V	RES M 47K-J-1/10W	
R093	ERJ6GEYJ331V	RES M 330-J-1/10W	
R150	ERQ12AJ101P	RES F 100-J-1/2W / CT-24SL13G CT-24SL13UG	
R202	ERJ6GEYJ222V	RES M 2.2K-J-1/10W	
R327	ERDS2TJ471T	RES C 470-J-1/4W	
R351	ERG2FJ123H	RES M 12K-J-2W / CT-20SL13G	
R351	ER0S2THF9100	RES M 910-F-1/4W / CT-24SL13G CT-24SL13UG	
R352	ERG2FJ123H	RES M 12K-J-2W / CT-20SL13G	
R352	ER0S2THF9100	RES M 910-F-1/4W / CT-24SL13G CT-24SL13UG	
R353	ERG2FJ123H	RES M 12K-J-2W / CT-20SL13G	
R353	ER0S2THF9100	RES M 910-F-1/4W / CT-24SL13G CT-24SL13UG	
R354	ERC12GK272C	RES C 2.7K-K-1/2W / CT-20SL13G	
R354	ERDS2TJ621T	RES C 620-J-1/4W / CT-24SL13G CT-24SL13UG	
R355	ERC12GK272C	RES C 2.7K-K-1/2W / CT-20SL13G	
R355	ERDS2TJ621T	RES C 620-J-1/4W / CT-24SL13G CT-24SL13UG	
R356	ERC12GK272C	RES C 2.7K-K-1/2W / CT-20SL13G	
R356	ERDS2TJ621T	RES C 620-J-1/4W / CT-24SL13G CT-24SL13UG	
R357	ERDS2TJ102T	RES C 1K-J-1/4W / CT-24SL13G CT-24SL13UG	
R357	ERJ6ENF4300V	RES M 430-F-1/10W / CT-20SL13G	
R358	ERDS1TJ124T	RES C 120K-J-1/2W / CT-24SL13G CT-24SL13UG	
R358	ERJ6ENF4300V	RES M 430-F-1/10W / CT-20SL13G	
R359	ERDS1TJ124T	RES C 120K-J-1/2W / CT-24SL13G CT-24SL13UG	
R359	ERJ6ENF4300V	RES M 430-F-1/10W / CT-20SL13G	
R360	ERDS1TJ124T	RES C 120K-J-1/2W / CT-24SL13G CT-24SL13UG	
R360	ERJ6ENF7500V	RES M 750-F-1/10W / CT-20SL13G	
R361	ERJ6ENF7500V	RES M 750-F-1/10W / CT-20SL13G	
R361	ER0S2THF8451	RES M 8.45K-F-1/4W / CT-24SL13G CT-24SL13UG	
R362	ERJ6ENF7500V	RES M 750-F-1/10W / CT-20SL13G	
R362	ER0S2THF2201	RES M 2.2K-F-1/4W / CT-24SL13G CT-24SL13UG	
R363	ERC12GK102D	RES C 1K-K-1/2W / CT-24SL13G CT-24SL13UG	
R363	ERJ6GEYJ101V	RES M 100-J-1/10W / CT-20SL13G	
R364	ERC12GK102D	RES C 1K-K-1/2W / CT-24SL13G CT-24SL13UG	
R364	ERJ6GEYJ101V	RES M 100-J-1/10W / CT-20SL13G	
R365	ERC12GK102D	RES C 1K-K-1/2W / CT-24SL13G CT-24SL13UG	
R365	ERJ6GEYJ101V	RES M 100-J-1/10W / CT-20SL13G	
R371	ERDS2TJ102T	RES C 1K-J-1/4W / CT-24SL13G CT-24SL13UG	
R371	ERJ6GEYJ101V	RES M 100-J-1/10W	
R372	ERDS2TJ102T	RES C 1K-J-1/4W / CT-24SL13G CT-24SL13UG	
R372	ERJ6GEYJ101V	RES M 100-J-1/10W	
R373	ERJ6GEYJ101V	RES M 100-J-1/10W	
R374	ERJ6GEYJ102V	RES M 1K-J-1/10W	
R374	ERQ12AJ121P	RES F 120-J-1/2W / CT-24SL13G CT-24SL13UG	
R375	ERJ6GEYJ102V	RES M 1K-J-1/10W	
R376	ERJ6GEYJ102V	RES M 1K-J-1/10W	
R377	ERJ6ENF3300V	RES M 330-F-1/10W	
R378	ERJ6ENF3300V	RES M 330-F-1/10W	
R379	ERJ6ENF3300V	RES M 330-F-1/10W	
R380	ERJ6ENF1501V	RES M 1.5K-F-1/10W	

Ref. No.	Part No.	Part Name & Description	Remarks
R381	ERJ6ENF1501V	RES M 1.5K-F-1/10W	
R382	ERJ6ENF1501V	RES M 1.5K-F-1/10W	
R383	ERJ6ENF3481V	RES M 3.48K-F-1/10W	
R384	ERJ6ENF7500V	RES M 750-F-1/10W	
R385	ERDS1FJ150P	RES C 15-J-1/2W	
R389	ERJ6GEYJ102V	RES M 1K-J-1/10W	
R390	ERJ6GEYJ102V	RES M 1K-J-1/10W	
R391	ERJ6GEYJ102V	RES M 1K-J-1/10W	
R411	ERJ6GEYJ682V	RES M 6.8K-J-1/10W	
R412	ERJ6GEYJ471V	RES M 470-J-1/10W	
R413	ERJ6GEYJ103V	RES M 10K-J-1/10W	
R414	ERJ6GEYJ471V	RES M 470-J-1/10W	
R451	ERDS1FJ1R0P	RES C 1.0-J-1/2W	
R452	ERDS1FJ1R0P	RES C 1.0-J-1/2W	
R453	ERJ6GEYJ113V	RES M 11K-J-1/10W / CT-20SL13G	
R453	ERJ6GEYJ333V	RES M 33K-J-1/10W / CT-24SL13G CT-24SL13UG	
R454	ERJ6GEYJ363V	RES M 36K-J-1/10W / CT-24SL13G CT-24SL13UG	
R454	ERJ6GEYJ513V	RES M 51K-J-1/10W / CT-20SL13G	
R455	ERJ6GEYJ103V	RES M 10K-J-1/10W / CT-24SL13G CT-24SL13UG	
R455	ERJ6GEYJ153V	RES M 15K-J-1/10W / CT-20SL13G	
R456	ERG3FJ151	RES M 150-J-3W	
R457	ERDS1FJ1R0P	RES C 1.0-J-1/2W	
R458	ERJ6GEYJ123V	RES M 12K-J-1/10W	
R459	ERJ6GEYJ152V	RES M 1.5K-J-1/10W	
R462	ERJ6GEYJ472V	RES M 4.7K-J-1/10W	
R463	ERJ6GEYJ473V	RES M 47K-J-1/10W	
R464	ERJ6GEYJ103V	RES M 10K-J-1/10W	
R468	ERJ6ENF1962V	RES M 19.6K-F-1/10W	
R469	ERJ6ENF5621V	RES M 5.62K-F-1/10W	
R471	ERJ6GEYJ333V	RES M 33K-J-1/10W / CT-20SL13G	
R471	ERJ6GEYJ363V	RES M 36K-J-1/10W / CT-24SL13G CT-24SL13UG	
R504	ERDS2TJ102T	RES C 1K-J-1/4W	
R505	ERJ6GEYJ562V	RES M 5.6K-J-1/10W	
R506	ERG1SJ562P	RES M 5.6K-J-1W	
R507	ER0S2THF1802	RES M 18K-F-1/4W	⚠
R509	ERJ6ENF1002V	RES M 10K-F-1/10W	⚠
R510	ERG3FJ272	RES M 2.7K-J-3W / CT-20SL13G	
R510	ERG3FJ332	RES M 3.3K-J-3W / CT-20SL13G	⚠
R510	ERG3FJ622	RES M 6.2K-J-3W / CT-24SL13G CT-24SL13UG	⚠
R511	ERG3FJ622	RES M 6.2K-J-3W / CT-24SL13G CT-24SL13UG	⚠
R512	ERJ6GEYJ222V	RES M 2.2K-J-1/10W	
R514	ERJ6GEYJ392V	RES M 3.9K-J-1/10W	
R515	ERDS2TJ101T	RES C 100-J-1/4W	
R532	ERJ6ENF2202V	RES M 22K-F-1/10W	⚠
R533	ERJ6ENF1003V	RES M 100K-F-1/10W	⚠
R540	ERJ6GEYJ105V	RES M 1M-J-1/10W	
R541	ERDS2TJ274T	RES C 27K-J-1/4W	
R542	ERJ6GEYJ124V	RES M 120K-J-1/10W	
R547	ERQ1CJPR82S	RES F .82-J-1W / CT-24SL13G CT-24SL13UG	⚠
R551	ERX12SJR47P	RES M .47-J-1/2W	⚠
R552	ERDS1FJ1R0T	RES C 1.0-J-1/2W	⚠

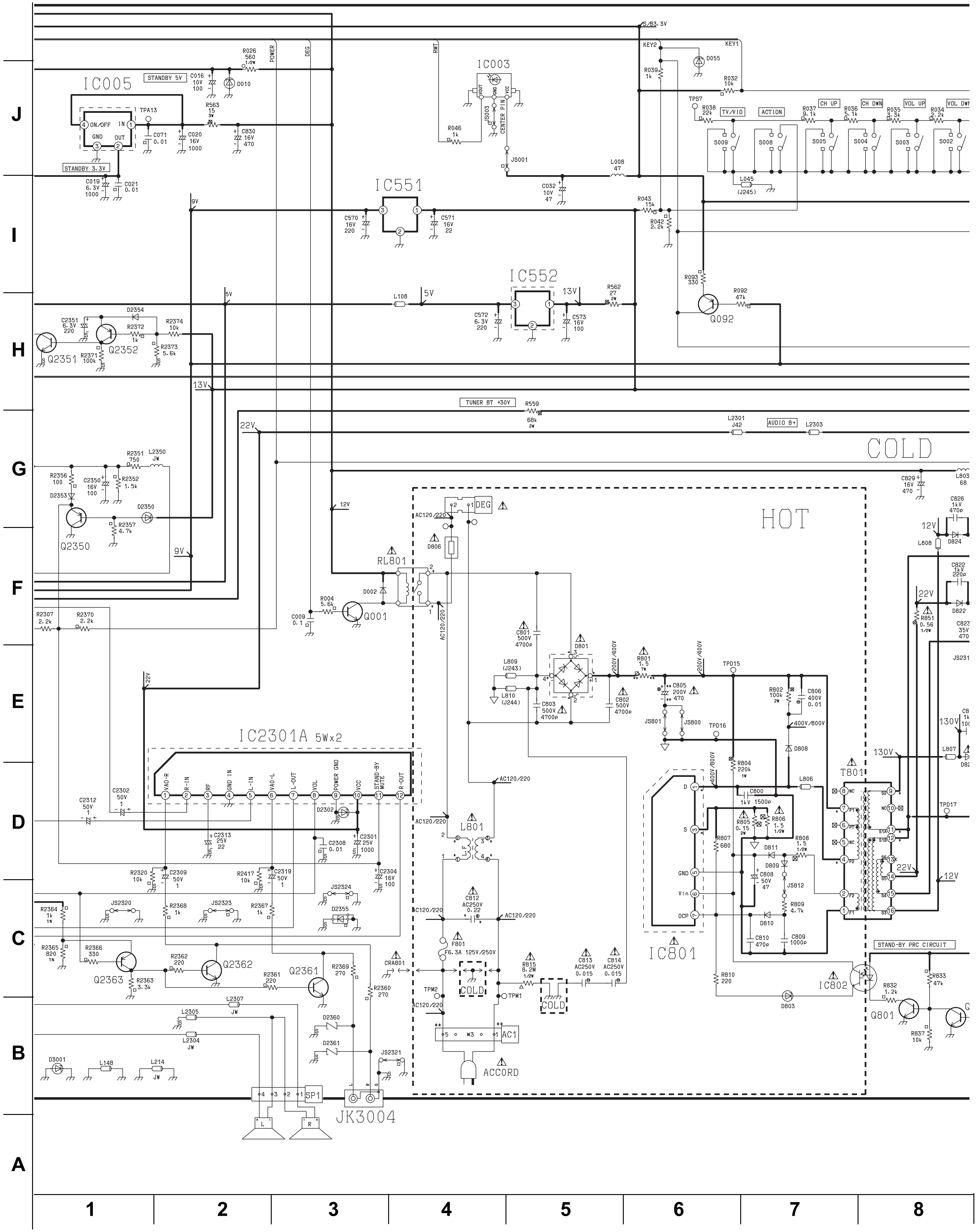
Ref. No.	Part No.	Part Name & Description	Remarks
R557	ERJ6GEYJ103V	RES M 10K-J-1/10W	
R559	ERG2FJ683H	RES M 12K-J-2W	
R561	ERG2FJ102H	RES M 1K-J-2W	
R562	ERG2FJ270H	RES M 27-J-2W	
R563	ERG3FJ150H	RES M 15-J-3W	
R564	ERDS2TJ563T	RES C 56K-J-1/4W / CT-24SL13G CT-24SL13UG	
R564	ERDS2TJ823T	RES C 82K-J-1/4W / CT-20SL13G	
R565	ERDS2TJ683T	RES C 68K-J-1/4W / CT-24SL13G CT-24SL13UG	
R565	ERDS2TJ823T	RES C 82K-J-1/4W / CT-20SL13G	
R592	ERJ6GEYJ472V	RES M 4.7K-J-1/10W	
R605	ERDS2TJ103T	RES C 10K-J-1/4W	
R606	ERJ6GEYJ562V	RES M 5.6K-J-1/10W	
R607	ERJ6GEYJ102V	RES M 1K-J-1/10W	
R608	ERJ6GEYJ104V	RES M 100K-J-1/10W	
R713	ERDS2TJ123T	RES C 12K-J-1/4W / CT-24SL13G CT-24SL13UG	
R716	ERDS2TJ101T	RES C 100-J-1/4W / CT-24SL13G CT-24SL13UG	
R756	ERG2FJ820H	RES M 82-J-2W / CT-24SL13G CT-24SL13UG	
R761	ERDS2TJ102T	RES C 1K-J-1/4W / CT-24SL13G CT-24SL13UG	
R762	ERDS2TJ472T	RES C 4.7K-J-1/4 / CT-24SL13G CT-24SL13UG	
R801	ERF7ZK1R5	RES W 1.5-K-7W / CT-24SL13G CT-24SL13UG	⚠
R802	ERG2FJ104H	RES M 100K-J-2W	
R804	ERG1DJ224P	RES M 220K-J-1W	
R805	ERX2FZJR15H	RES M .18-J-2W	⚠
R806	ERX12SJ1R5P	RES M 1.5-J-1/2W	⚠
R807	ERDS2TJ681T	RES C 680-J-1/4W	
R808	ERX12SJ1R5P	RES M 1.5-J-1/2W	
R809	ERDS2TJ472T	RES C 4.7K-J-1/4	
R810	ERDS2TJ221T	RES C 220-J-1/4W	
R815	ERC12ZGK825D	RES C 8.2MEG-K-1/2W	⚠
R817	ERX3SJ6R8H	RES M 6.8-J-3W / CT-20SL13G	⚠
R821	ERDS1FJ1R0T	RES C 1.0-J-1/2W / CT-24SL13G CT-24SL13UG	
R821	ERDS1FJ1R5T	RES C 1.5-J-1/2W / CT-20SL13G	
R822	ERDS1FJ1R0T	RES C 1.0-J-1/2W / CT-24SL13G CT-24SL13UG	
R822	ERDS1FJ1R5T	RES C 1.5-J-1/2W / CT-20SL13G	
R823	ERDS1FJ272T	RES C 2.7K-J-1/2W	
R824	ERDS2TJ223T	RES C 22K-J-1/4W	
R825	ERDS2TJ272T	RES C 2.7K-J-1/4W	
R827	ERJ6GEYJ153V	RES M 15K-J-1/10W	
R828	ERJ6GEYJ104V	RES M 100K-J-1/10W	
R829	ERJ6GEYJ104V	RES M 100K-J-1/10W	
R830	ERG2FJ273H	RES M 27K-J-2W	
R831	ERDS2TJ682T	RES C 6.8K-J-1/4W	
R832	ERJ6GEYJ122V	RES M 1.2K-J-1/10W	
R833	ERJ6GEYJ473V	RES M 47K-J-1/10W	
R834	ERJ6GEYJ472V	RES M 4.7K-J-1/10W	
R837	ERJ6GEYJ103V	RES M 10K-J-1/10W	
R838	ERJ6GEYJ103V	RES M 10K-J-1/10W	
R851	ERQ12HJR56P	RES F .56-J-1/2W	⚠
R902	ERJ6GEYJ392V	RES M 3.9K-J-1/10W / CT-24SL13G CT-24SL13UG	
R903	ERJ6GEYJ561V	RES M 560-J-1/10W / CT-24SL13G CT-24SL13UG	
R905	ERJ6GEYJ102V	RES M 1K-J-1/10W / CT-24SL13G CT-24SL13UG	
R906	ERJ6GEYJ102V	RES M 1K-J-1/10W / CT-24SL13G CT-24SL13UG	

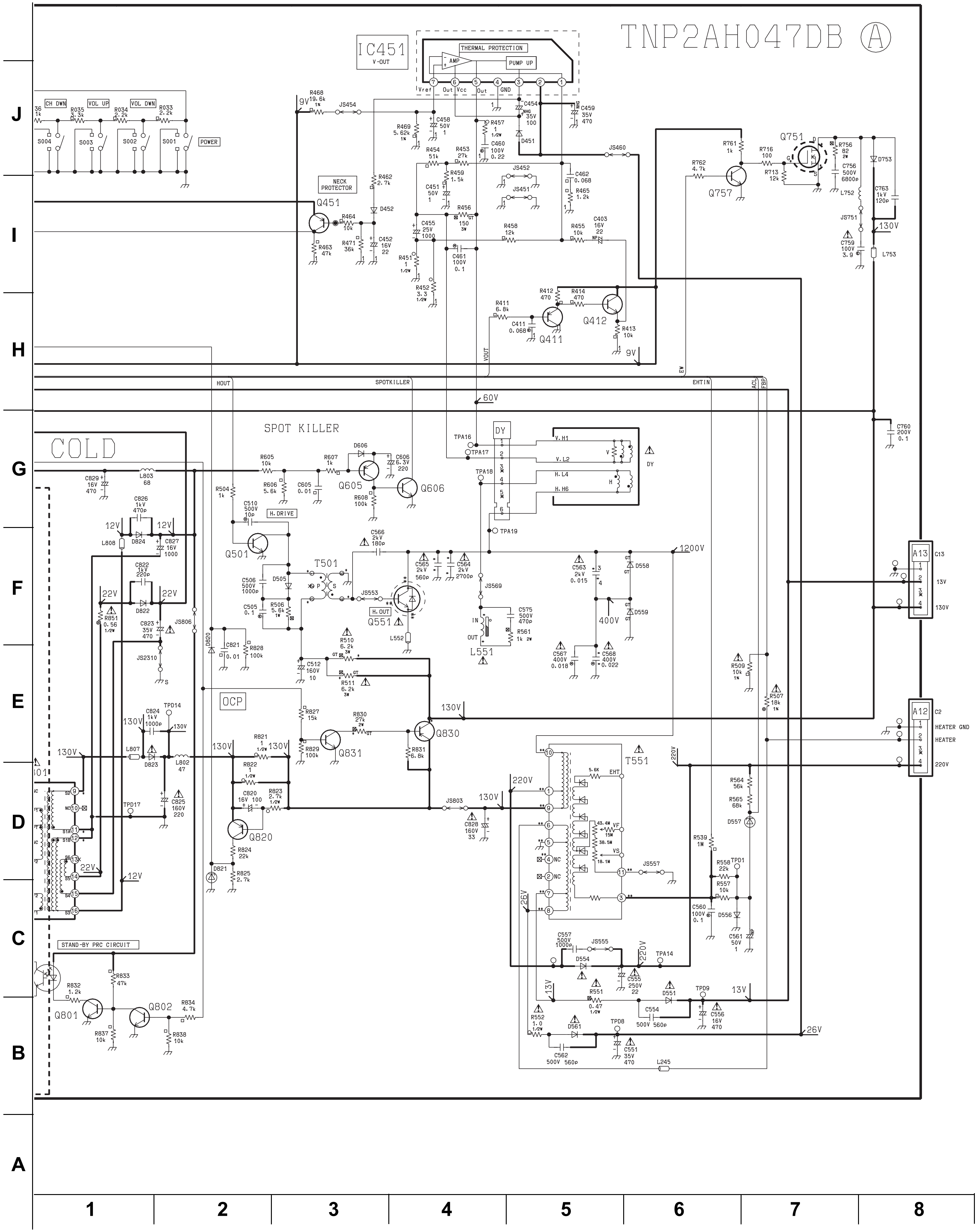
Ref. No.	Part No.	Part Name & Description	Remarks
R908	ERJ6GEYJ683V	RES M 68K-J-1/10W / CT-24SL13G CT-24SL13UG	
R909	ERJ6GEYJ103V	RES M 10K-J-1/10W / CT-24SL13G CT-24SL13UG	
R951	ERDS2TJ821T	RES C 820-J-1/4W / CT-24SL13G CT-24SL13UG	
R952	ERDS2TJ153T	RES C 15K-J-1/4W / CT-24SL13G CT-24SL13UG	
R953	ERDS2TJ332T	RES C 3.3K-J-1/4W / CT-24SL13G CT-24SL13UG	
R954	ERDS2TJ431T	RES C 430-J-1/4W / CT-24SL13G CT-24SL13UG	
R956	ERDS2TJ121T	RES C 120-J-1/4W / CT-24SL13G CT-24SL13UG	
R958	ERDS2TJ391T	RES C 390-J-1/4W / CT-24SL13G CT-24SL13UG	
R959	ERDS2TJ101T	RES C 100-J-1/4W / CT-24SL13G CT-24SL13UG	
R960	ERQ14AJ100E	RES F 10-J-1/4W / CT-24SL13G CT-24SL13UG	
R961	ERQ1CJP331S	RES F 330-J-1W / CT-24SL13G CT-24SL13UG	
R962	ERDS2TJ330T	RES C 33-J-1/4W / CT-24SL13G CT-24SL13UG	
R963	ERDS2TJ330T	RES C 33-J-1/4W / CT-24SL13G CT-24SL13UG	
R964	ERDS2TJ471T	RES C 470-J-1/4W / CT-24SL13G CT-24SL13UG	
R965	ERDS2TJ563T	RES C 56K-J-1/4W / CT-24SL13G CT-24SL13UG	
R966	ERDS1FVJ471T	RES C 470-J-1/4W / CT-24SL13G CT-24SL13UG	
R967	ERDS2TJ563T	RES C 56K-J-1/4W / CT-24SL13G CT-24SL13UG	
R968	ERDS2TJ471T	RES C 470-J-1/4W / CT-24SL13G CT-24SL13UG	
R969	ERDS2TJ390T	RES C 39-J-1/2W / CT-24SL13G CT-24SL13UG	
R970	ERDS2TJ2R2T	RES C 2.2-J-1/4W / CT-24SL13G CT-24SL13UG	
R971	ERDS2TJ2R2T	RES C 2.2-J-1/4W / CT-24SL13G CT-24SL13UG	
R972	ERDS2TJ390T	RES C 39-J-1/2W / CT-24SL13G CT-24SL13UG	
R973	ERDS2TJ101T	RES C 100-J-1/4W / CT-24SL13G CT-24SL13UG	
R974	ERDS2TJ333T	RES C 33K-J-1/4W / CT-24SL13G CT-24SL13UG	
R975	ERDS2TJ101T	RES C 100-J-1/4W / CT-24SL13G CT-24SL13UG	
R976	ERDS2TJ101T	RES C 100-J-1/4W / CT-24SL13G CT-24SL13UG	
R977	ERDS2TJ561T	RES C 560-J-1/4W / CT-24SL13G CT-24SL13UG	
R978	ERDS2TJ101T	RES C 100-J-1/4W / CT-24SL13G CT-24SL13UG	
R987	ERDS2TJ472T	RES C 4.7K-J-1/4W / CT-24SL13G CT-24SL13UG	
R988	ERDS2TJ331T	RES C 330-J-1/4W / CT-24SL13G CT-24SL13UG	
R989	ERDS2TJ682T	RES C 6.8K-J-1/4W / CT-24SL13G CT-24SL13UG	
R990	ERDS2TJ471T	RES C 470-J-1/4W / CT-24SL13G CT-24SL13UG	
R993	ERDS2TJ471T	RES C 470-J-1/4W / CT-24SL13G CT-24SL13UG	
R2201	ERJ6GEYJ224V	RES M 220K-J-1/10W	
R2203	ERJ6GEYJ102V	RES M 1K-J-1/10W	
R2204	ERJ6GEYJ102V	RES M 1K-J-1/10W	
R2205	ERDS2TJ101T	RES C 100-J-1/4W	
R2206	ERDS2TJ273T	RES C 27K-J-1/4W	
R2307	ERDS2TJ222T	RES C 2.2K-J-1/4W	
R2320	ERJ6GEYJ103V	RES M 10K-J-1/10W	
R2351	ERJ6GEYJ751V	RES M 750-J-1/10W	
R2352	ERJ6GEYJ152V	RES M 1.5K-J-1/10W	
R2356	ERJ6GEYJ101V	RES M 100-J-1/10W	
R2357	ERJ6GEYJ472V	RES M 4.7K-J-1/10W	
R2360	ERJ6GEYJ271V	RES M 270-J-1/10W	
R2361	ERJ6GEYJ221V	RES M 220-J-1/10W	
R2362	ERJ6GEYJ221V	RES M 220-J-1/10W	
R2363	ERJ6GEYJ332V	RES M 3.3K-J-1/10W	
R2364	ERJ6ENF1001V	RES M 1K-F-1/10W	
R2365	ERJ6ENF8200V	RES M 820-F-1/10W	
R2366	ERJ6GEYJ331V	RES M 330-J-1/10W	
R2367	ERJ6GEYJ102V	RES M 1K-J-1/10W	
R2368	ERJ6GEYJ102V	RES M 1K-J-1/10W	
R2369	ERJ6GEYJ271V	RES M 270-J-1/10W	

Ref. No.	Part No.	Part Name & Description	Remarks
R2370	ERJ6GEYJ222V	RES M 2.2K-J-1/10W	
R2417	ERJ6GEYJ103V	RES M 10K-J-1/10W	
R2504	ERDS2TJ101T	RES C 100-J-1/4W	
R2505	ERDS2TJ101T	RES C 100-J-1/4W	
R3001	ERDS2TJ101T	RES C 100-J-1/4W	
R3002	ERJ6GEYJ221V	RES M 220-J-1/10W	
R3003	ERJ6GEYJ221V	RES M 220-J-1/10W	
R3004	ERDS2TJ101T	RES C 100-J-1/4W	
R3005	ERJ6GEYJ334V	RES M 330K-J-1/10W	
R3006	ERJ6ENF75R0V	RES M 75.0-F-1/10W	
R3007	ERJ6ENF75R0V	RES M 75.0-F-1/10W	
R3008	ERJ6ENF75R0V	RES M 75.0-F-1/10W	
R3010	ERJ6GEYJ334V	RES M 330K-J-1/10W	
R3013	ERJ6ENF75R0V	RES M 75.0-F-1/10W	
R3014	ERJ6ENF75R0V	RES M 75.0-F-1/10W	
R3015	ERJ6ENF75R0V	RES M 75.0-F-1/10W	
R3016	ERDS2TJ181T	RES C 180-J-1/4W	
R3017	ERDS2TJ181T	RES C 180-J-1/4W	
R3018	ERDS2TJ101T	RES C 100-J-1/4W	
R3020	ERJ6GEYJ682V	RES M 6.8K-J-1/10W / CT-24SL13G CT-24SL13UG	
R3021	ERDS2TJ101T	RES C 100-J-1/4W	
R3022	ERDS2TJ101T	RES C 100-J-1/4W	
R3023	ERDS2TJ101T	RES C 100-J-1/4W	
R3024	ERDS2TJ101T	RES C 100-J-1/4W	
R3025	ERDS2TJ101T	RES C 100-J-1/4W	
R3026	ERDS2TJ101T	RES C 100-J-1/4W	
R3027	ERDS2TJ101T	RES C 100-J-1/4W	
R3030	ERJ6GEYJ223V	RES M 22K-J-1/10W	
R3031	ERJ6GEYJ223V	RES M 22K-J-1/10W	
R3032	ERJ6GEYJ223V	RES M 22K-J-1/10W	
R3033	ERJ6GEYJ223V	RES M 22K-J-1/10W	
R3034	ERJ6GEYJ471V	RES M 470-J-1/10W	
R3035	ERJ6GEYJ562V	RES M 5.6K-J-1/10W	
R3036	ERJ6GEYJ183V	RES M 18K-J-1/10W	
R3037	ERJ6GEYJ471V	RES M 470-J-1/10W	
R3038	ERJ6GEYJ562V	RES M 5.6K-J-1/10W	
R3039	ERJ6GEYJ183V	RES M 18K-J-1/10W	
R3041	ERJ6GEYJ472V	RES M 4.7K-J-1/10W	
R3042	ERJ6GEYJ472V	RES M 4.7K-J-1/10W	
R3101	ERJ6GEYJ334V	RES M 330K-J-1/10W	
R3102	ERJ6GEYJ334V	RES M 330K-J-1/10W	
R3103	ERJ6GEYJ334V	RES M 330K-J-1/10W	
R3104	ERJ6GEYJ334V	RES M 330K-J-1/10W	
R3131	ERJ6GEYJ223V	RES M 22K-J-1/10W	
R3132	ERJ6GEYJ223V	RES M 22K-J-1/10W	
R3133	ERJ6GEYJ153V	RES M 15K-J-1/10W	
R3134	ERJ6GEYJ333V	RES M 33K-J-1/10W	
R3135	ERJ6GEYJ154V	RES M 150K-J-1/10W	
		SWITCHES	
S001	EVQPF106K	SWITCH	
S002	EVQPF106K	SWITCH	
S003	EVQPF106K	SWITCH	
S004	EVQPF106K	SWITCH	
S005	EVQPF106K	SWITCH	

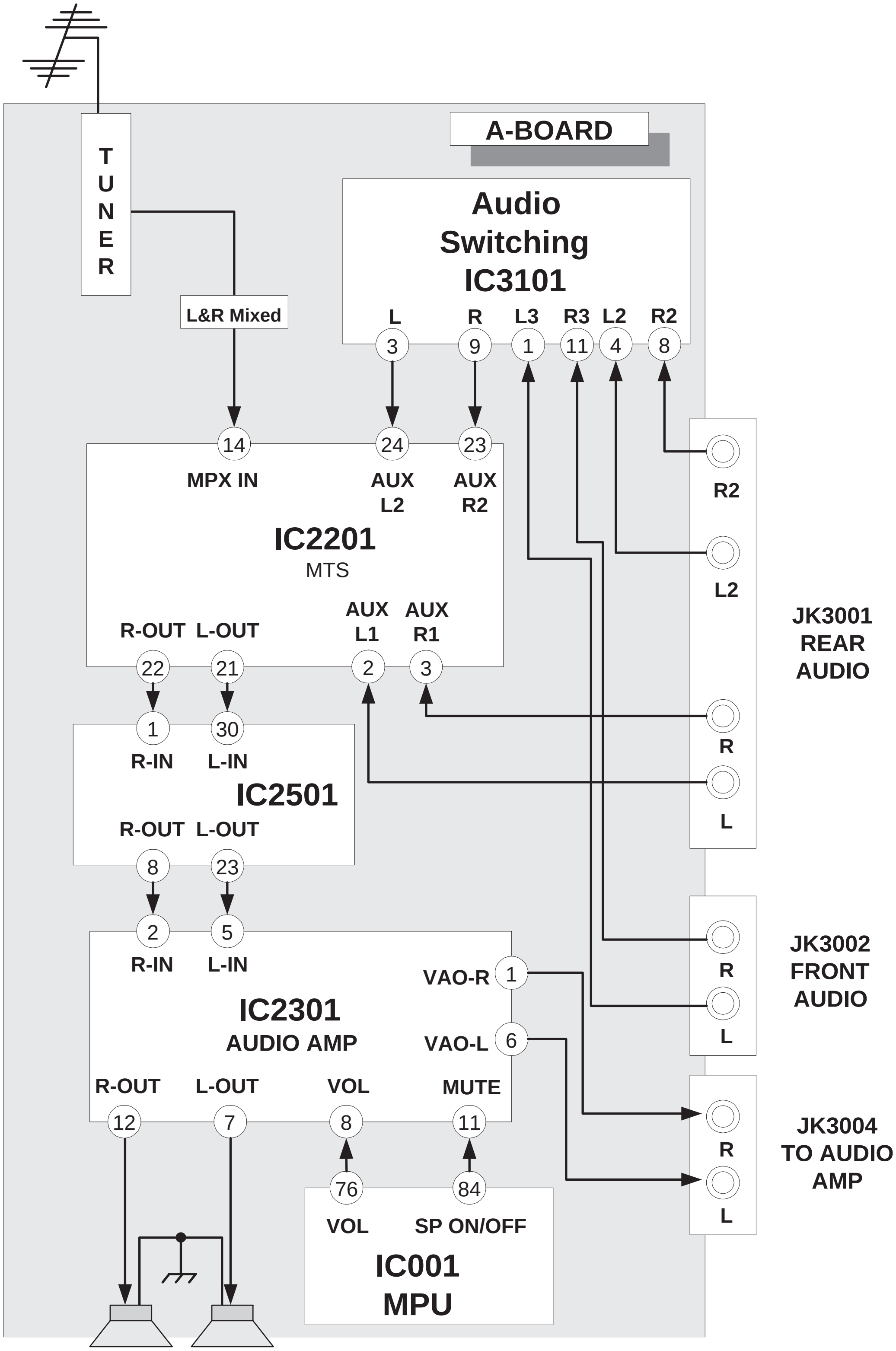
Ref. No.	Part No.	Part Name & Description	Remarks
S008	EVQPF106K	SWITCH	
S009	EVQPF106K	SWITCH	
TRANSFORMERS			
T501	ETH19Y211AZ	TRANSFORMER / CT-24SL13G CT-24SL13UG	
T501	ETH19Y22AY	TRANSFORMER HORIZONTAL DRIVE / CT-20SL13G	
T551	KFT3AA341F	FLYBACK TRANSFORMER / CT-20SL13G	⚠
T551	TLF2AA005	FLYBACK TRANSFORMER / CT-24SL13G CT-24SL13UG	⚠
T801	ETS29AS1N5NC	TRANSFORMER / CT-20SL13G	⚠
T801	ETS35AA6B5NC	TRANSFORMER / CT-24SL13G CT-24SL13UG	⚠
T3001	TF0402B04P03	TRANSFORMER	
T3002	TF0402B04P03	TRANSFORMER	
CRYSTALS/FILTERS			
X001	A1100005BD	CRYSTAL	
OTHERS			
TNR001	ENG36621G	TUNER	⚠
1	A51QDX992X	20 INCH CRT / CT-20SL13G	⚠
	A60LUQ085X	24 INCH CRT / CT-24SL13G CT-24SL13UG	⚠
M001	TJSC00300	CRT SOCKET / CT-20SL13G	⚠
	TJS2AC00401	CRT SOCKET / CT-24SL13G CT-24SL13UG	⚠
2	TLY2AA028	DEFLECTION YOKE / CT-20SL13G	⚠
	TLY2AA029	DEFLECTION YOKE WITH CONV & PURITY RINGS / CT-24SL13G CT-24SL13UG	⚠
3	TXF3A01BA3	DAG GND CT-20SL13G	
	TXF3A01DB3	DAG GND / CT-24SL13G CT-24SL13UG	
4	TSP2AA023	DEGAUSSING COIL / CT-24SL13G CT-24SL13UG	⚠
	TSP2AA029	DEGAUSSING COIL / CT-20SL13G	⚠
5	JH291U-009	CONVERGENCE & PURITY RINGS / CT-20SL13G	
6	EASG12D552C2	SPEAKER	
M002	TXFKP13GSER	SPEAKER BRACKET	
7	TBX2AA0211	7-KEY BUTTON	
8	TKP2AA0842S	FRONT DOOR / CT-20SL13G	
	TKP2AA0832S	FRONT DOOR / CT-24SL13G CT-24SL13UG	
9	TEK6935	DOOR CATCH	
10	TKX2AA0135	IR GUIDE / CT-24SL13G CT-24SL13UG	
	TKX2AA0136	IR GUIDE / CT-20SL13G	
M003	0FMK014ZZ	CONVERGENCE CORRECTOR STRIP	
M004	TSN63115-4	PURITY MAGNET	
M005	TSX2AA0361	AC LINE CORD	⚠
11	TXFKY27GSER	FRONT CABINET / CT-20SL13G	
	TXFKY28GSER	FRONT CABINET / CT-24SL13G CT-24SL13UG	
12	TXFKU18GSER	BACK CABINET / CT-20SL13G	
	TXFKU19GSER	BACK CABINET / CT-24SL13G CT-24SL13UG	
JK3001	TJB2AA0221	8 PIN A/V JACK	
JK3002	TJB2AA0045	FRONT A/V JACK	
JK3003	TJB2AA0421	S-VIDEO JACK	
JK3004	TJB2AA0211-1	2 PIN AUDIO OUT JACK	
OTHER ACCESSORIES			
M006	EUR7613Z60	REMOTE CONTROL	
M007	UR76EC0303D	REMOTE CONTROL BATTERY COVER	

Ref. No.	Part No.	Part Name & Description	Remarks
M008	**TQB2AA0454**	**OWNER'S MANUAL**	

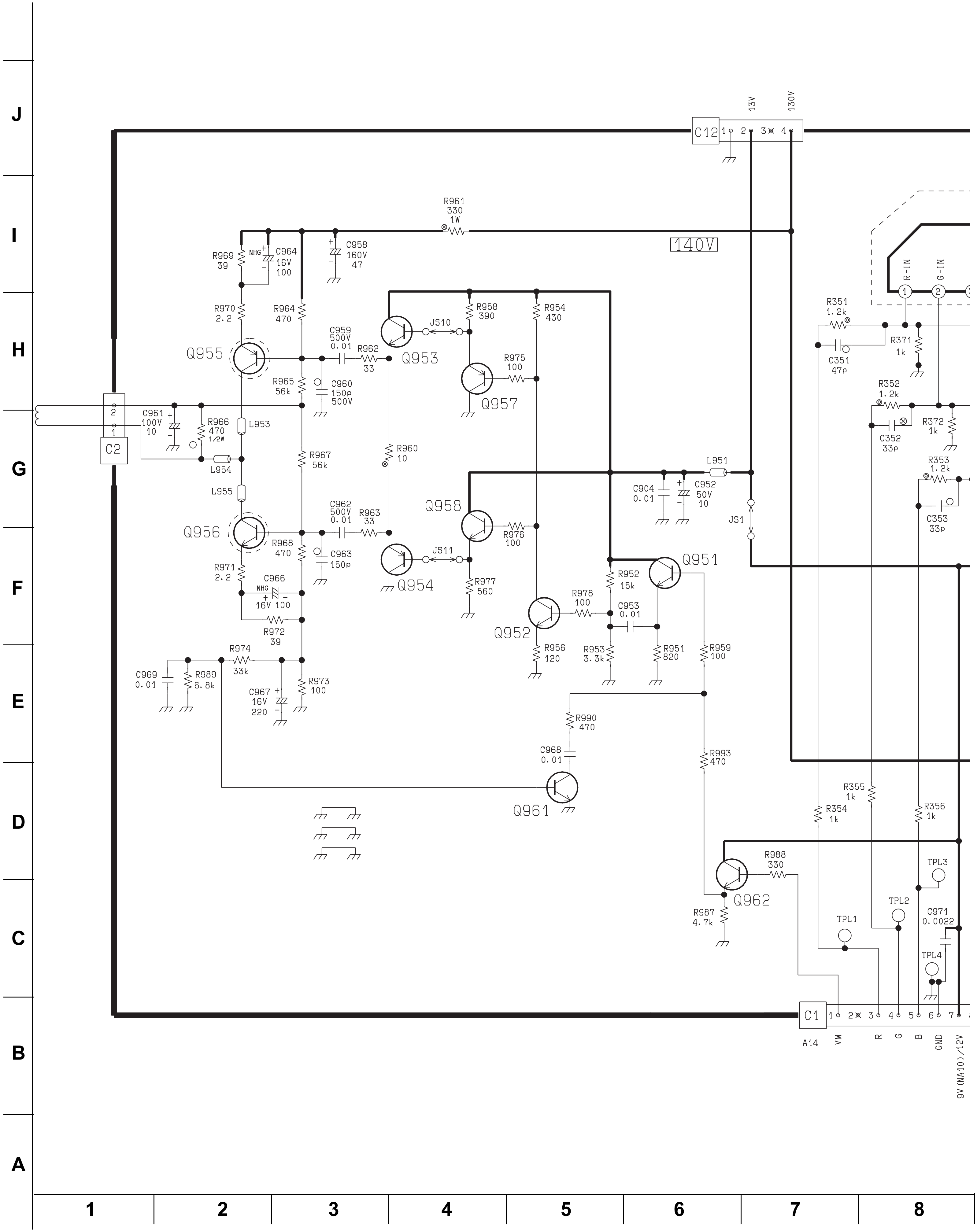

J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
IC005
STANDBY 5V
STANDBY 3.3V
ON/OFF
IN
GND
OUT
TPA13
C071 0.01
C020 16V 1000
R563 15 3W
C830 16V 470
C016 10V 100
D010
R026 560 1/2W
POWER
DEG
RMT
C019 6.3V 1000
C021 0.01
IC003
VOUT
GND
VCC
JS003
CENTER PIN
R046 1k
JS001
C032 10V 47
L008 47
S/B3.3V
KEY2
KEY1
D055
R039 1k
R032 10k
TPS7
R038 22k
TV/VID
ACTION
R037 9.1k
CH UP
R036 5.1k
CH DWN
R035 3.3k
VOL UP
R034 2.2k
VOL DWN
S009
S008
S005
S004
S003
S002
L045 (J245)
IC551
C570 16V 220
C571 16V 22
9V
R043 15k
R042 2.2k
5V
L108
C572 6.3V 220
IC552
13V
R562 27 2W
C573 16V 100
R093 330
R092 47k
Q092
C2351 6.3V 220
D2354
R2372 1k
R2374 10k
Q2351
Q2352
R2371 100k
R2373 5.6k
13V
TUNER BT +30V
R559 68k 2W
22V
L2301 J42
AUDIO B+
L2303
COLD
R2351 750
L2350 JW
R2356 100
C2350 16V 100
R2352 1.5k
D2353
D2350
R2357 4.7k
Q2350
C829 16V 470
L803 68
12V
DEG
AC120/220
D806
RL801
HOT
C826 1kV 470p
L808
D824
9V
D002
R004 5.6k
Q001
C009 0.1
C822 1kV 220p
22V
D822
R851 0.56 1/2W
C823 35V 470
R2307 2.2k
R2370 2.2k
C801 500V 4700p
D801
L809 (J243)
L810 (J244)
C803 500V 4700p
C802 500V 4700p
200V/400V
R801 1.5 7W
C805 200V 470
JS801
JS800
TPD15
TPD16
R802 100k 2W
C806 400V 0.01
400V/800V
D808
JS231
130V
L807
IC2301A 5W×2
VAO-R
R-IN
RF
GND IN
L-IN
VAO-L
L-OUT
VOL
POWER GND
VCC
STAND-BY MUTE
R-OUT
C2312 50V 1
C2302 50V 1
D2302
C2313 25V 22
C2308 0.01
C2301 25V 1000
AC120/220
L801
L.F.
D
S
GND
Vin
OCP
R804 220k 1W
C800 1kV 1500p
L806
T801
NC
P1
P2
F2
F1
S2
S1A
S1B
S6
S5
S4
S3
TPD17
R805 0.15 2W
R806 1.5 1/2W
R807 680
R808 1.5 1/2W
D811
D809
C808 50V 47
JS812
R809 4.7k
D810
C810 470p
C809 1000p
IC801
R2320 10k
C2309 50V 1
R2417 10k
C2319 50V 1
C2304 16V 100
JS2324
R2364 1k 1%
JS2320
R2368 1k
JS2323
R2367 1k
D2355
R2365 820 1%
R2366 330
Q2363
R2363 3.3k
R2362 220
Q2362
R2361 220
Q2361
R2369 270
R2360 270
C812 AC250V 0.22
F801 F6.3A 125V/250V
CRAB01
R815 8.2M 1/2W
C813 AC250V 0.015
C814 AC250V 0.015
TPM2
TPM1
STAND-BY PRC CIRCUIT
R810 220
IC802
D803
R833 47k
R832 1.2k
Q801
R837 10k
L2307 JW
L2305
L2304 JW
D2360
D2361
JS2321
AC1
ACCORD
D3001
L148
L214 JW
SP1
JK3004
L
R
G

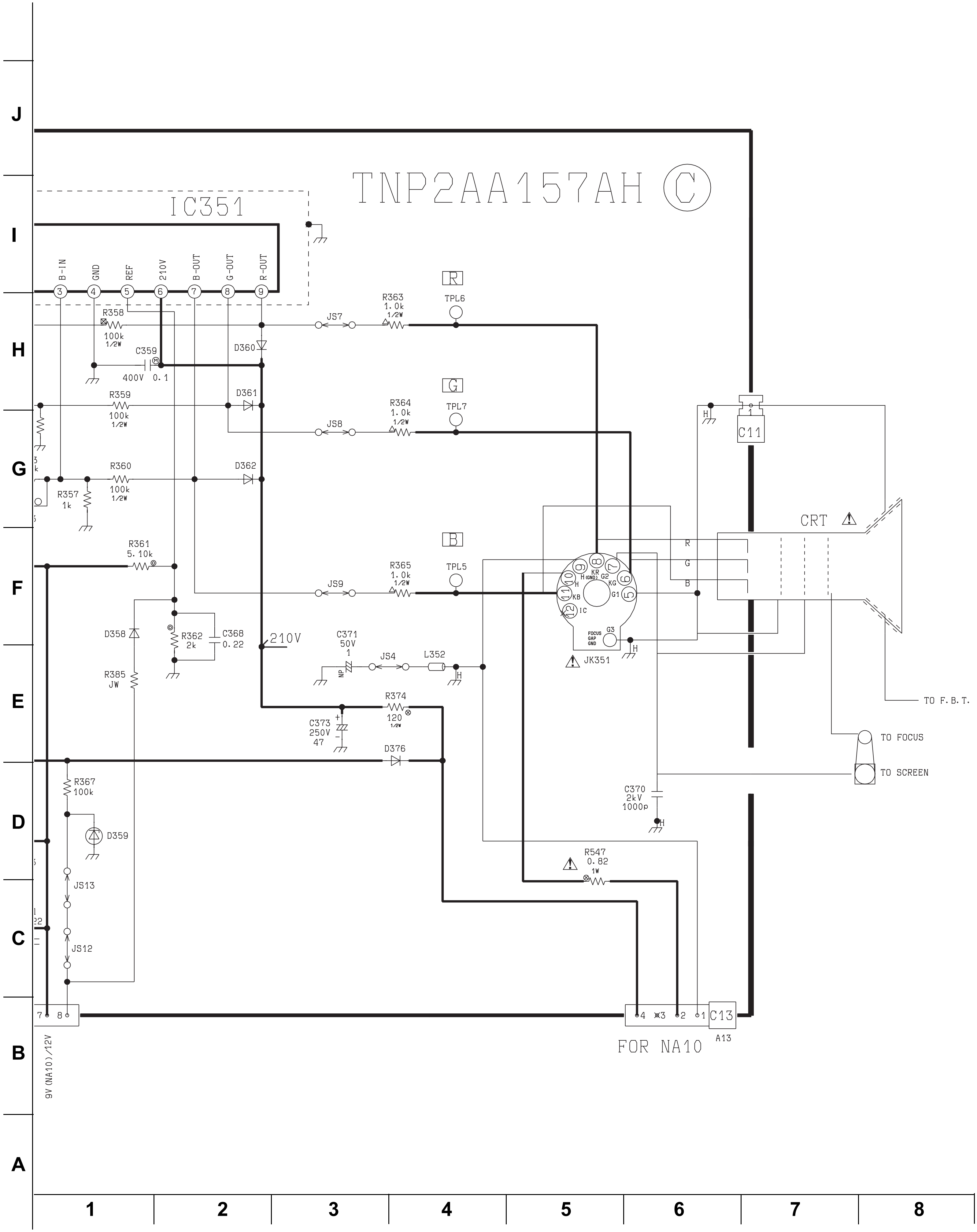

TNP2AH047DB Ⓐ
IC451
V-OUT
THERMAL PROTECTION
AMP
PUMP UP
Vref
Out
Vcc
Out
GND
CH DWN
VOL UP
VOL DWN
POWER
S004
S003
S002
S001
R035 3.3k
R034 2.2k
R033 2.2k
R468 19.6k 1%
JS454
9V
NECK PROTECTOR
Q451
R464 10k
R463 47k
R471 36k
R462 2.7k
D452
C452 16V 22
R469 5.62k 1%
C458 50V 1
R457 1 1/2W
C460 100V 0.22
C454 35V 100
D451
C459 35V 470
R454 51k
R453 27k
R459 1.5k
C451 50V 1
R456 150 3W
C455 25V 1000
R451 1 1/2W
R452 3.3 1/2W
C461 100V 0.1
C462 0.068
R465 1.2k
JS452
JS451
R458 12k
R455 10k
C403 16V 22
JS460
R411 6.8k
C411 0.068
Q411
R412 470
R414 470
Q412
R413 10k
VOUT
R761 1k
R762 4.7k
Q757
R716 100
R713 12k
Q751
R756 82 2W
C756 500V 6800P
D753
L752
C763 1kV 120P
JS751
C759 100V 3.9
L753
130V
HOUT
SPOTKILLER
EW
EHTIN
ACL
FBP
60V
C760 200V 0.1
SPOT KILLER
COLD
R605 10k
R607 1k
D606
C606 6.3V 220
R606 5.6k
C605 0.01
Q605
Q606
R608 100k
R504 1k
C510 500V 10P
H.DRIVE
C829 16V 470
L803 68
C826 1kV 470P
12V
D824
C827 16V 1000
L808
C822 1kV 220P
22V
D822
R851 0.56 1/2W
C823 35V 470
JS806
JS2310
Q501
T501
C566 2kV 180P
C565 2kV 560P
C564 2kV 2700P
C506 500V 1000P
D505
C505 0.1
R506 5.6k 1W
JS553
H.OUT
Q551
L552
DY
TPA16
TPA17
TPA18
TPA19
V.H1
V.L2
H.L4
H.H6
1200V
C563 2kV 0.015
D558
D559
400V
JS569
L551
C575 500V 470P
R561 1k 2W
C567 400V 0.018
C568 400V 0.022
D820
C821 0.01
R828 100k
R510 6.2k 3W
R511 6.2k 3W
C512 160V 10
OCP
R827 15k
R830 27k 2W
Q830
Q831
R829 100k
R831 6.8k
C824 1kV 1000P
TPD14
L807
D823
L802 47
C825 160V 220
TPD17
R821 1 1/2W
R822 1 1/2W
C820 16V 100
R823 2.7k 1/2W
Q820
R824 22k
R825 2.7k
D821
JS803
C828 160V 33
T551
EHT
VF
VS
JS557
220V
26V
R564 56k
R565 68k
D557
R539 1M
R558 22k
R557 10k
TPD1
D556
C560 100V 0.1
C561 50V 1
R509 10k 1%
R507 18k 1%
A13
C13
13V
A12
C2
HEATER GND
HEATER
STAND-BY PRC CIRCUIT
Q801
Q802
R832 1.2k
R833 47k
R834 4.7k
R837 10k
R838 10k
C557 500V 1000P
JS555
D554
C555 250V 22
TPA14
R551 0.47 1/2W
D551
TPD9
C554 500V 560P
C556 16V 470
R552 1.0 1/2W
D561
TPD8
C562 500V 560P
C551 35V 470
L245
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8

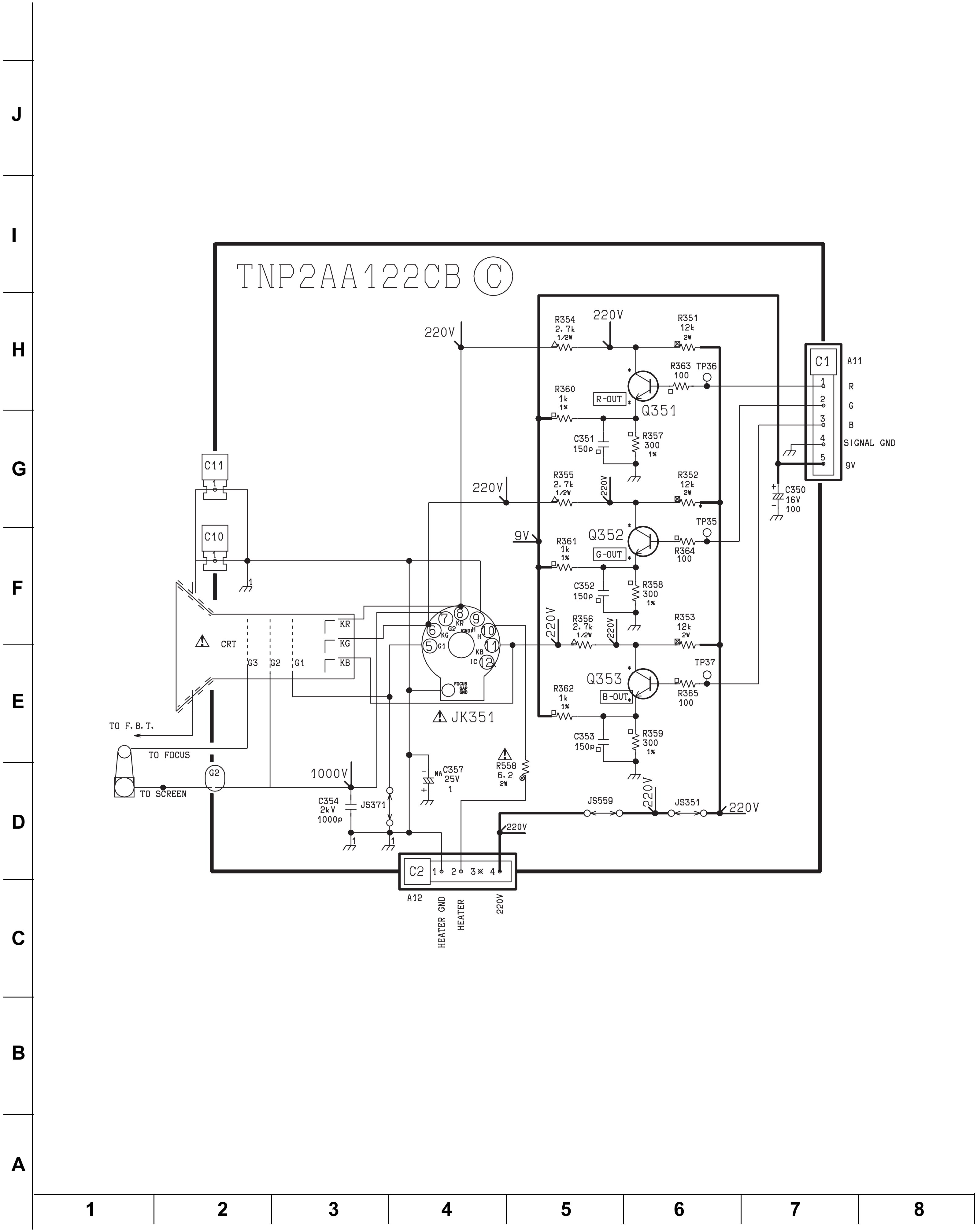
Audio signal path block diagram

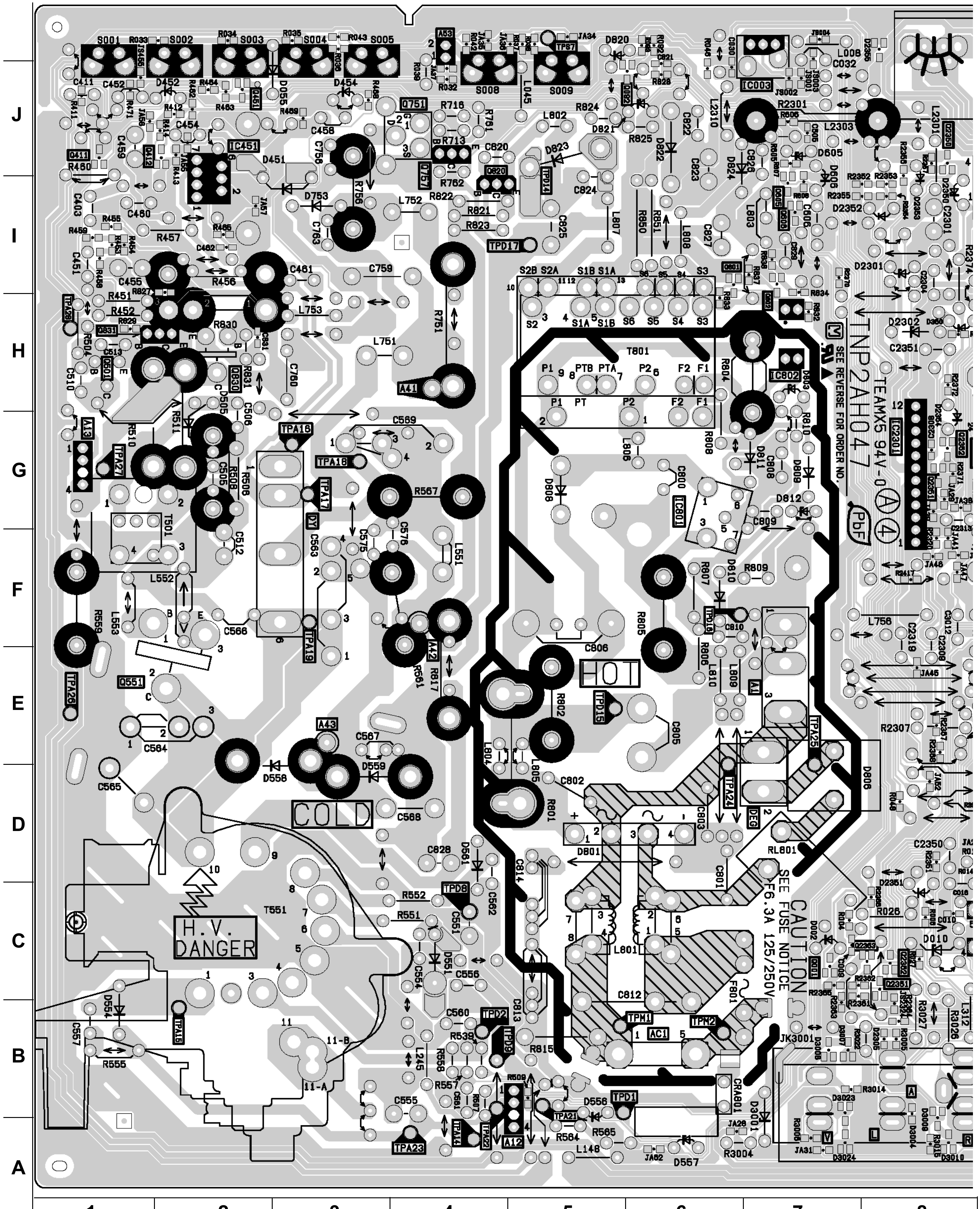

A-BOARD
TUNER
L&R Mixed
Audio Switching IC3101
L 3
R 9
L3 1
R3 11
L2 4
R2 8
14 MPX IN
24 AUX L2
23 AUX R2
IC2201
MTS
R-OUT 22
L-OUT 21
AUX L1 2
AUX R1 3
R2
L2
JK3001 REAR AUDIO
R
L
1 R-IN
30 L-IN
IC2501
R-OUT 8
L-OUT 23
2 R-IN
5 L-IN
IC2301
AUDIO AMP
VAO-R 1
VAO-L 6
R-OUT 12
L-OUT 7
VOL 8
MUTE 11
JK3002 FRONT AUDIO
R
L
JK3004 TO AUDIO AMP
R
L
76 VOL
84 SP ON/OFF
IC001
MPU

CT-20SL13G/CT-24SL13G & CT-24SL13UG

J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
C12
13V
130V
R961 330 1W
140V
R969 39
NHG
C964 16V 100
C958 160V 47
R970 2.2
R964 470
R958 390
R954 430
JS10
C959 500V 0.01
R962 33
Q955
Q953
R975 100
Q957
R965 56k
C960 150p 500V
C2
C961 100V 10
R966 470 1/2W
L953
L954
R967 56k
R960 10
L951
C904 0.01
C952 50V 10
JS1
L955
Q958
C962 500V 0.01
R963 33
Q956
R976 100
R968 470
C963 150p
JS11
Q954
R971 2.2
C966 NHG 16V 100
R977 560
R952 15k
Q951
R978 100
C953 0.01
Q952
R972 39
R956 120
R953 3.3k
R951 820
R959 100
R974 33k
C969 0.01
R989 6.8k
C967 16V 220
R973 100
R990 470
C968 0.01
R993 470
Q961
R-IN
G-IN
R351 1.2k
C351 47p
R371 1k
R352 1.2k
C352 33p
R372 1k
R353 1.2k
C353 33p
R355 1k
R354 1k
R356 1k
R988 330
Q962
R987 4.7k
TPL1
TPL2
TPL3
TPL4
C971 0.0022
C1
A14
VM
R
G
B
GND
9V(NA10)/12V

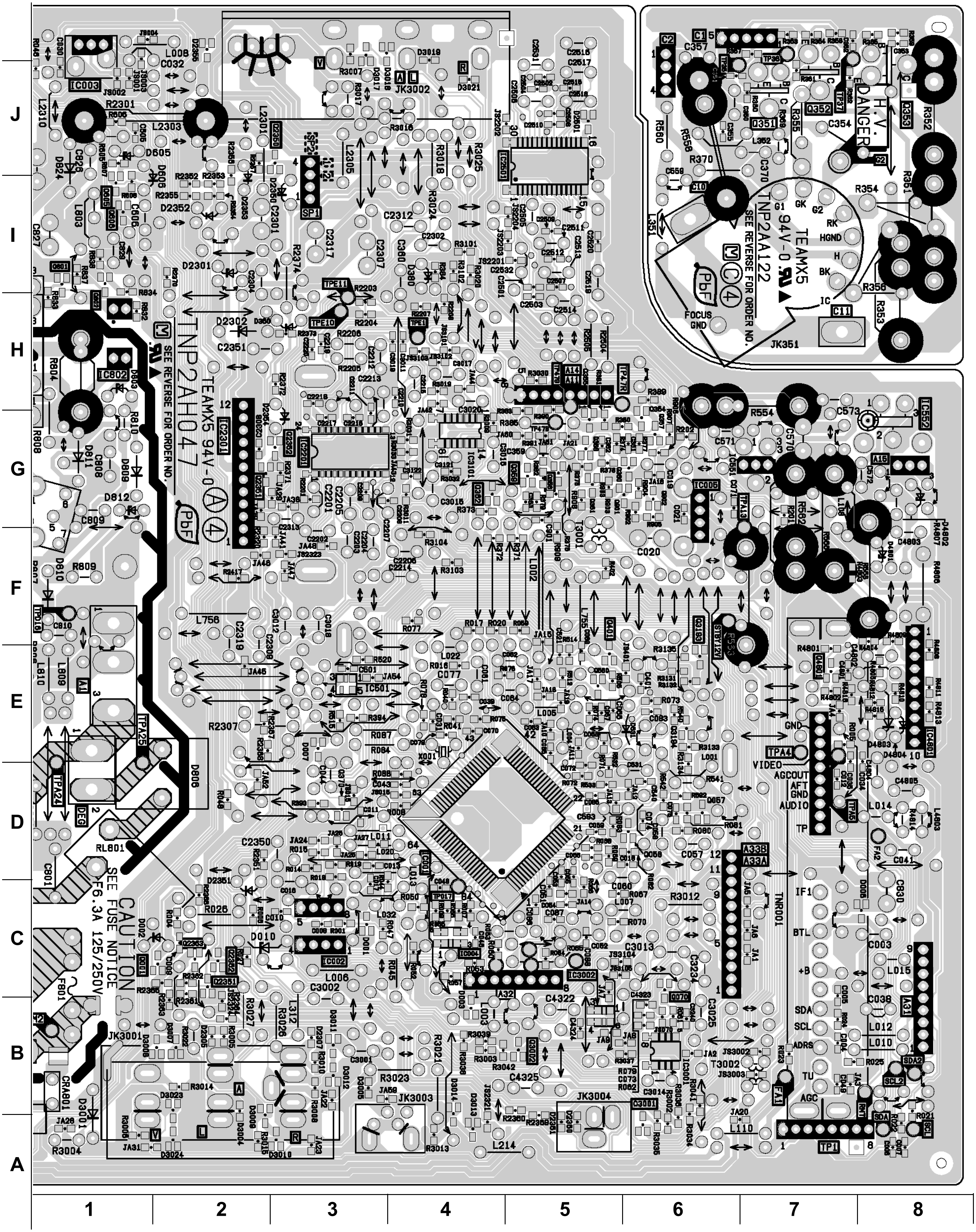

TNP2AA157AH Ⓒ
IC351
B-IN
GND
REF
210V
B-OUT
G-OUT
R-OUT
R358
100k
1/2W
C359
400V 0.1
D360
R363
1.0k
1/2W
JS7
TPL6
R
R359
100k
1/2W
D361
R364
1.0k
1/2W
JS8
TPL7
G
R360
100k
1/2W
D362
R357
1k
R361
5.10k
R365
1.0k
1/2W
JS9
TPL5
B
D358
R362
2k
C368
0.22
210V
R385
JW
C371
50V
1
NP
JS4
L352
R374
120
1/2W
C373
250V
47
D376
R367
100k
D359
JS13
JS12
9V (NA10)/12V
C11
CRT ⚠
R
G
B
KR
KG
KB
G1
G2
H (GND)
H
IC
G3
FOCUS GAP GND
⚠ JK351
TO F.B.T.
TO FOCUS
TO SCREEN
C370
2kV
1000p
⚠ R547
0.82
1W
C13
A13
FOR NA10
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8


TNP2AA122CB
C
220V
R354
2.7k
1/2W
R351
12k
2W
R363
100
TP36
C1
A11
1 R
2 G
3 B
4 SIGNAL GND
5 9V
R360
1k
1%
R-OUT
Q351
C351
150p
R357
300
1%
R355
2.7k
1/2W
R352
12k
2W
C350
16V
100
Q352
TP35
9V
R361
1k
1%
G-OUT
R364
100
C352
150p
R358
300
1%
R356
2.7k
1/2W
R353
12k
2W
Q353
TP37
R362
1k
1%
B-OUT
R365
100
C353
150p
R359
300
1%
C11
C10
CRT
KR
KG
KB
G3
G2
G1
JK351
KR
KG
G2
G1
H
(GND)
KB
IC
FOCUS GAP GND
TO F.B.T.
TO FOCUS
TO SCREEN
G2
1000V
C354
2kV
1000p
JS371
C357
NA
25V
1
R558
6.2
2W
JS559
JS351
C2
A12
HEATER GND
HEATER
220V
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8



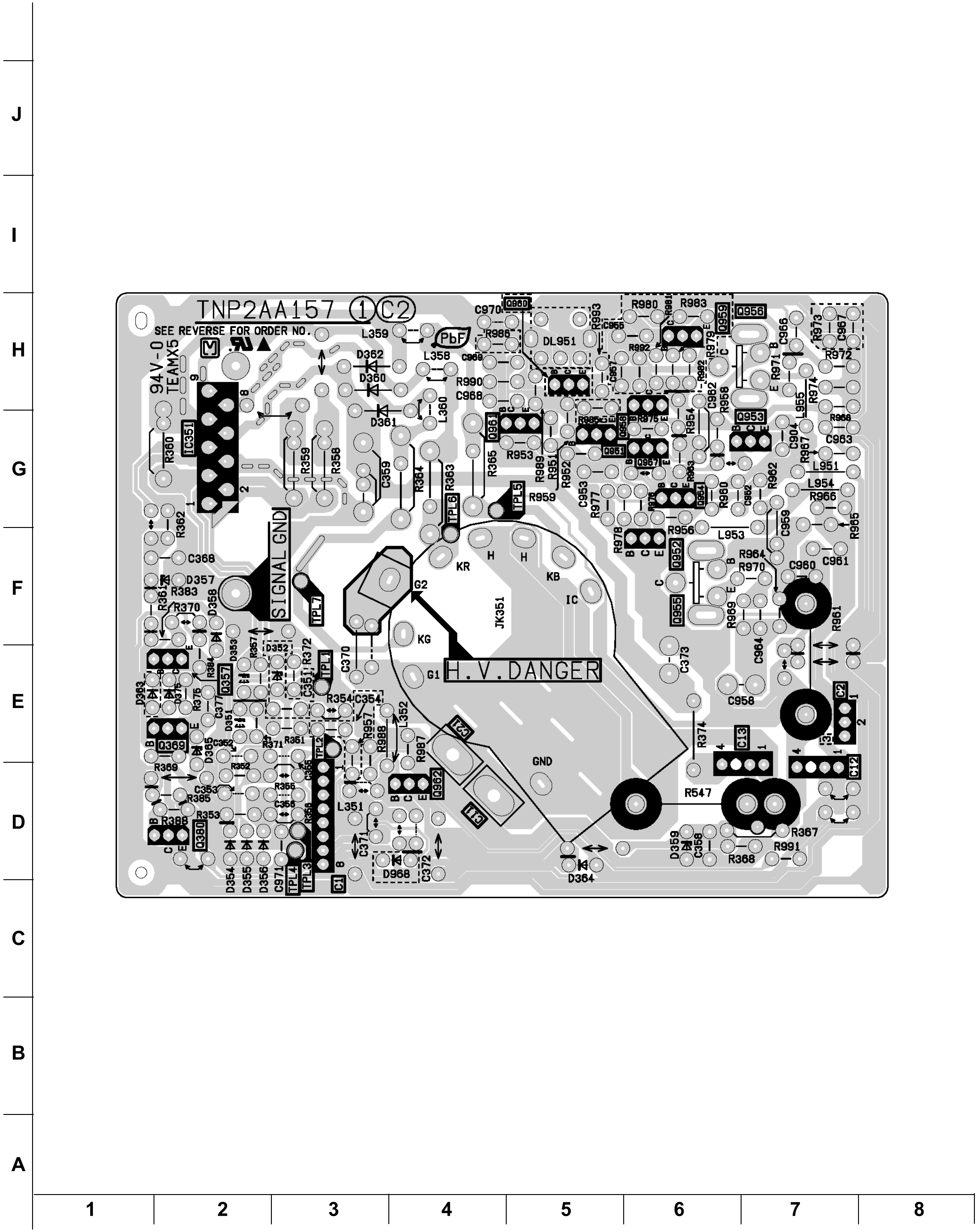
H.V. DANGER
HOT
COLD
CAUTION
SEE FUSE NOTICE
F6.3A 125/250V
TNP2AH047
TEAMX5 94V-0
SEE REVERSE FOR ORDER NO.
PbF
T801
T551
T501
IC451
IC801
IC802
IC2301
IC003
RL801
D801
L801
F801
JK3001
S001
S002
S003
S004
S005
S008
S009
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8

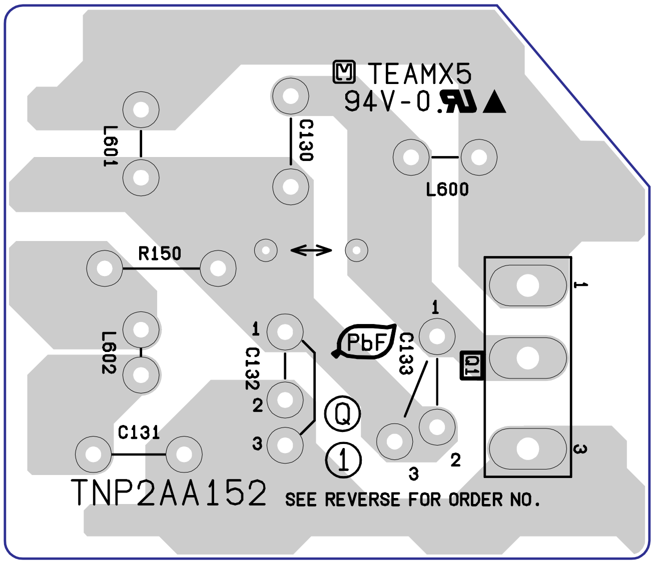
A-BOARD 1 of 2 TNP2AH047 CT-20SL13G / CT-24SL13G / CT-24SL13UG



J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
TNP2AH047
TEAMX5 94V-0
SEE REVERSE FOR ORDER NO.
PbF
TNP2AA122
TEAMX5 94V-0
SEE REVERSE FOR ORDER NO.
PbF
H.V. DANGER
JK351
FOCUS
GND
G1
GK
G2
RK
HGND
H
BK
IC
CAUTION
SEE FUSE NOTICE
F6.3A 125/250V
F801
RL801
JK3001
JK3002
JK3003
JK3004
IC501
IC3001
IC3002
IC2301
IC2501
IC802
IC003
IC002
IC004
IC005
IC551
IC552
IC4801
T3001
T3002
TNR001
GND
VIDEO
AGCOUT
AFT
GND
AUDIO
TP
IF1
BTL
+B
SDA
SCL
ADRS
TU
AGC
TP1
SP1
A1
A32
A33A
A33B
A31
A14
A11
A15
TPA4
TPA5
TPA24
TPA25
D808
CRA801

A-BOARD 2 of 2 TNP2AH047 C-BOARD TNP2AA122 CT-20SL13G / CT-24SL13G / CT-24SL13UG


J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
TNP2AA157 ① C2
SEE REVERSE FOR ORDER NO.
94V-0
TEAMX5
PbF
IC351
SIGNAL GND
H.V.DANGER
JK351
GND
KR
H
KB
IC
G2
KG
G1
TPL1
TPL2
TPL3
TPL4
TPL5
TPL6
TPL7
C1
C2
C11
C12
C13
C21
DL951
R547
Q351
Q357
Q369
Q380
Q951
Q952
Q953
Q955
Q956
Q957
Q958
Q959
Q960
Q961
Q962
Q964
L351
L352
L358
L359
L360
L951
L953
L954
L955
D352
D353
D354
D355
D356
D357
D358
D359
D360
D361
D362
D363
D364
D365
D375
D968



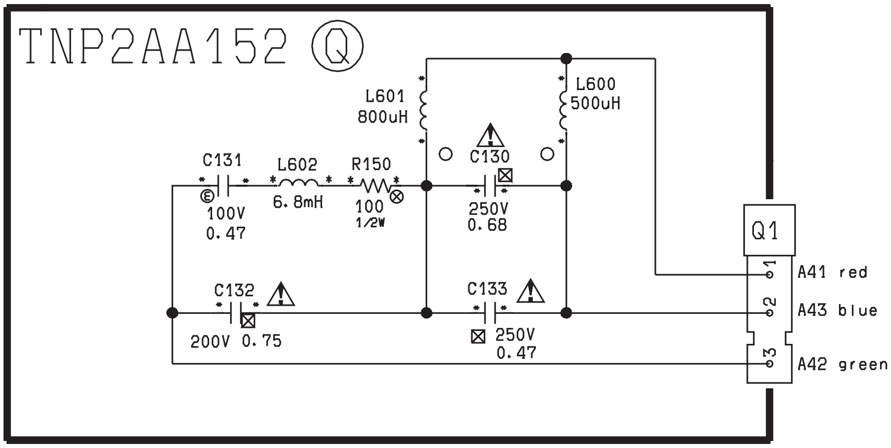
TEAMX5
94V-0
L601
C130
L600
R150
L602
C132
C133
Q1
C131
1
2
3
Q
1
TNP2AA152
SEE REVERSE FOR ORDER NO.

J

I

H

G


TNP2AA152 Ⓠ
L601
800uH
L600
500uH
C131
100V
0.47
L602
6.8mH
R150
100
1/2W
C130
250V
0.68
C132
200V 0.75
C133
250V
0.47
Q1
1
2
3
A41 red
A43 blue
A42 green

F

E

D

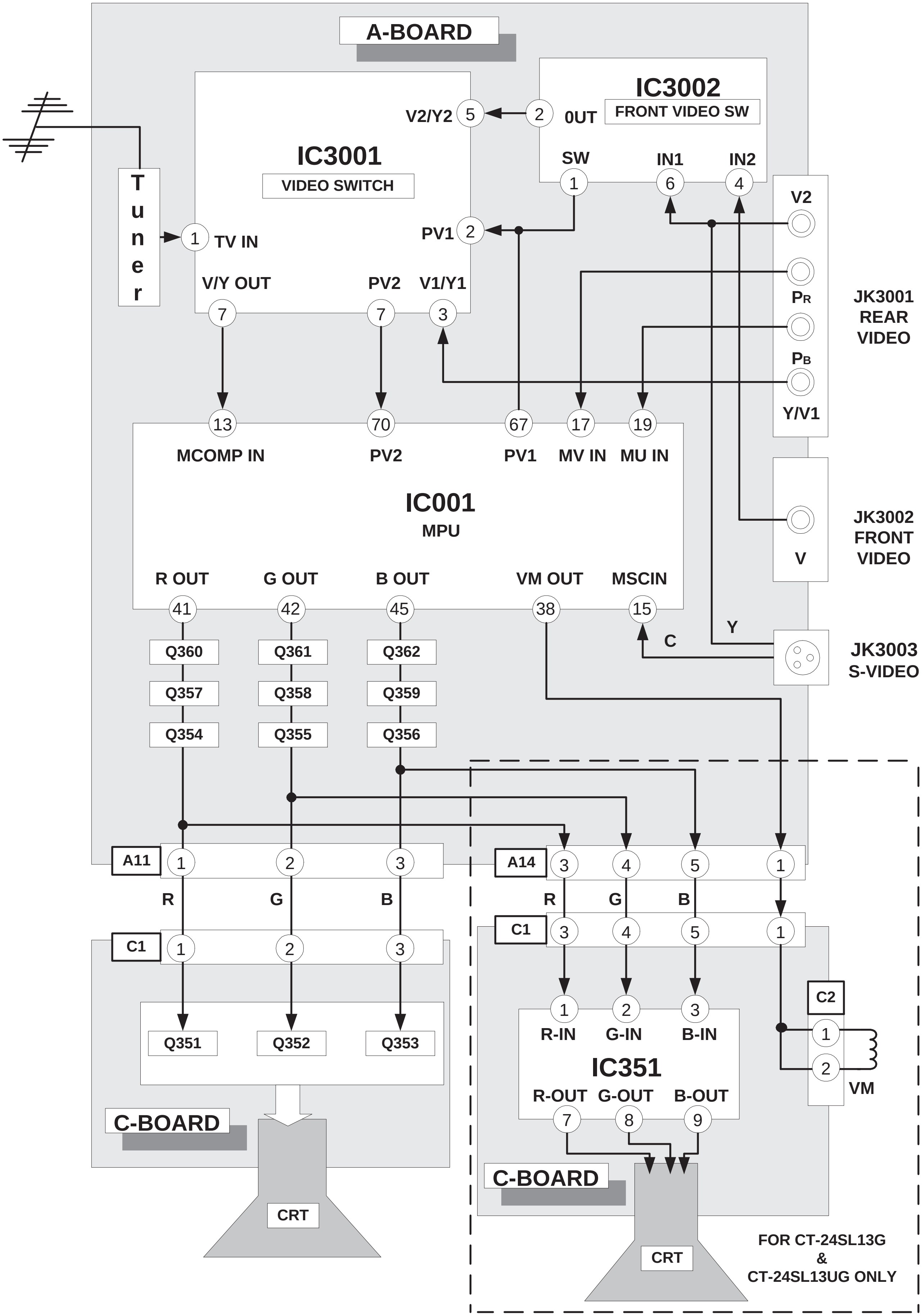
C

B

A

1 2 3 4 5 6 7 8

Video signal path block diagram


A-BOARD
IC3002
FRONT VIDEO SW
2
0UT
SW
1
IN1
6
IN2
4
IC3001
VIDEO SWITCH
V2/Y2
5
PV1
2
1
TV IN
Tuner
V/Y OUT
7
PV2
7
V1/Y1
3
V2
PR
PB
Y/V1
JK3001
REAR
VIDEO
V
JK3002
FRONT
VIDEO
13
MCOMP IN
70
PV2
67
PV1
17
MV IN
19
MU IN
IC001
MPU
R OUT
41
G OUT
42
B OUT
45
VM OUT
38
MSCIN
15
Y
C
JK3003
S-VIDEO
Q360
Q357
Q354
Q361
Q358
Q355
Q362
Q359
Q356
A11
1
2
3
R
G
B
C1
1
2
3
Q351
Q352
Q353
C-BOARD
CRT
A14
3
4
5
1
R
G
B
C1
3
4
5
1
1
R-IN
2
G-IN
3
B-IN
IC351
R-OUT
G-OUT
B-OUT
7
8
9
C2
1
2
VM
C-BOARD
CRT
FOR CT-24SL13G
&
CT-24SL13UG ONLY

CT-20SL13G/CT-24SL13G & CT-24SL13UG

A - BOARD - TNP2AH047

IC001			
1	0.00	43	2.50
2	0.00	44	1.70
3	0.00	45	0.00
4	0.00	46	0.00
5	0.00	47	3.30
6	1.20	48	1.90
7	1.20	49	1.90
8	1.30	50	1.60
9	3.30	51	1.70
10	0.00	52	3.30
11	2.70	53	1.70
12	1.50	54	1.40
13	1.40	55	3.30
14	0.40	56	1.40
15	1.60	57	0.00
16	2.20	58	0.00
17	1.70	59	3.30
18	1.70	60	3.30
19	1.40	61	3.30
20	1.40	62	0.70
21	1.00	63	3.30
22	2.60	64	3.30
23	0.00	65	3.40
24	1.90	66	3.50
25	1.90	67	0.10
26	1.40	68	3.20
27	1.28	69	0.00
28	0.00	70	0.00
29	1.30	71	0.00
30	1.80	72	5.20
31	1.00	73	5.20
32	3.30	74	0.00
33	1.70	75	0.00
34	0.80	76	0.00
35	0.00	77	3.30
36	0.60	78	0.00
37	3.30	79	0.00
38	3.30	80	3.30
39	2.30	81	5.20
40	1.70	82	3.30
41	0.40	83	0.00
42	0.40	84	3.30

IC002	
1	0.00
2	0.00
3	0.00
4	0.00
5	3.40
6	3.40
7	5.20
8	5.20

IC003	
1	0.00
2	3.31
3	3.27

IC004	
1	0.00
2	0.00
3	0.00
4	3.30
5	3.30

IC005	
1	9.10
2	3.30
3	0.00
4	9.10

IC451	
1	2.00
2	27.80
3	1.20
4	0.00
5	17.60
6	27.90
7	2.00

IC501	
1	0.00
2	1.35
3	0.00
4	1.05
5	3.30

IC551	
1	12.20
2	0.00
3	9.00

IC552	
1	7.50
2	0.00
3	5.00

IC801↓	
1	-21.00
2	N/C
3	0.10
4	N/C
5	GND
6	32.24
7	1.50

IC802↓	
1	2.30
2	32.24

IC2201			
1	1.60	13	2.80
2	2.20	14	2.20
3	2.20	15	2.50
4	2.30	16	3.50
5	2.40	17	0.00
6	0.07	18	3.20
7	5.00	19	3.40
8	2.50	20	0.00
9	2.60	21	2.20
10	0.80	22	2.20
11	2.30	23	2.20
12	2.50	24	2.20

IC2501			
1	4.40	16	8.90
2	0.00	17	0.00
3	0.00	18	0.00
4	4.50	19	3.80
5	4.50	20	3.80
6	4.50	21	4.40
7	4.50	22	4.80
8	4.50	23	4.40
9	1.00	24	4.50
10	4.50	25	4.60
11	3.60	26	4.50
12	3.60	27	4.50
13	2.90	28	0.00
14	3.20	29	0.00
15	0.00	30	4.40

IC3001	
1	4.10
2	0.20
3	4.10
4	0.00
5	4.10
6	9.00
7	4.30
8	0.00

IC3002	
1	0.20
2	4.40
3	8.90
4	5.10
5	0.00
6	5.10

IC2301	
1	7.50
2	5.60
3	21.00
4	0.00
5	5.60
6	7.50
7	10.60
8	1.30
9	0.00
10	22.70
11	3.20
12	10.20

IC3101	
1	0.10
2	4.40
3	4.40
4	4.40
5	7.80
6	7.80
7	0.00
8	4.40
9	4.40
10	4.40
11	0.00
12	0.00
13	0.00
14	8.90

A - BOARD - TNP2AH047

	Q001	Q057	Q058	Q070	Q092	Q2350	Q2361	Q2362	Q2363
B	0.00	1.50	1.50	4.12	8.90	5.35	0.30	0.00	1.34
C	13.00	0.00	0.00	8.90	1.40	0.00	0.00	0.10	0.00
E	0.00	0.07	0.07	3.50	3.30	3.14	0.00	0.00	1.50

	Q3001	Q3002	Q3193	Q3194	Q354	Q355	Q356	Q357	Q358
B	1.30	1.30	0.60	0.05	4.50	4.30	4.40	2.60	2.60
C	3.30	3.30	0.03	7.80	8.50	8.40	8.40	4.50	4.30
E	0.70	0.70	0.00	0.00	3.80	3.60	3.70	2.00	2.00

	Q359	Q360	Q361	Q362	Q411	Q412	Q451	Q501	Q551
B	2.60	0.50	0.40	0.40	2.25	2.90	5.10	0.40	0.00
C	4.40	0.00	0.00	0.00	0.00	9.00	1.40	56.80	14.70
E	2.00	1.10	1.10	1.10	2.90	2.40	3.30	0.00	0.00

	Q560	Q605	Q606	Q801	Q802	Q820	Q830	Q831
B	0.30	4.80	0.00	0.00	0.70	130.40	129.80	0.60
C	0.00	0.00	3.30	12.52	0.00	0.00	130.40	0.20
E	0.60	4.70	0.00	0.00	0.00	130.80	130.50	0.00

	*Q751
G	7.50
D	8.90
S	0.00

	*Q757
B	0.00
C	7.60
E	0.00

	*Q901	*Q902
B	1.00	5.20
C	5.20	2.40
E	0.40	5.80

***For models (CT-24SL13 and CT-24SL13UG) only.**

C - BOARD - TNP2AA122 (CT-20SL13G)

	Q351	Q352	Q353
B	1.90	1.50	6.30
C	8.90	5.70	8.90
E	1.50	1.50	5.70

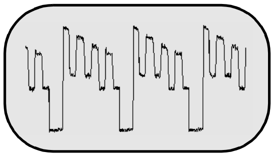
C - BOARD - TNP2AA157 (CT-24E13G and CT-24E13UG)

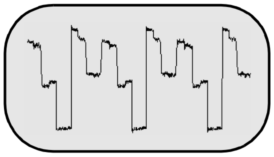
IC351	
1	..... 2.40
2	..... 2.40
3	..... 2.40
4	..... 0.00
5	..... 2.50
6	... 216.80
7	... 145.30
8	... 152.70
9	... 151.00

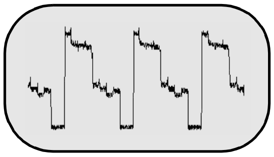
	Q951	Q952	Q953	Q954	Q955
B	1.90	1.50	6.30	5.10	122.70
C	8.90	5.70	8.90	0.00	105.30
E	1.50	1.50	5.70	5.60	121.90

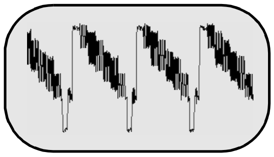
	Q956	Q957	Q958	Q961	Q962
B	0.80	5.80	5.70	0.30	2.40
C	65.20	0.00	8.90	1.80	8.90
E	0.30	6.30	5.10	0.00	1.90

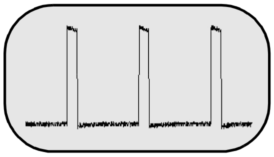
A-Board


① **4.6 Vp-p**
A11 PIN 5 (BLUE OUT)


② **4.6 Vp-p**
A11 PIN 3 (RED OUT)

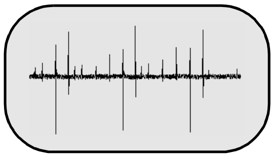

③ **4.6 V-p**
A11 PIN 4 (GREEN OUT)

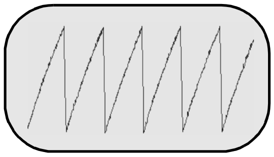

④ **1.3 Vp-p**
TPA5 (VIDEO)

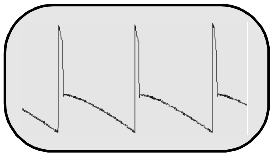

⑤ **3.40 Vp-p**
IC001 PIN 36 (FBP IN)

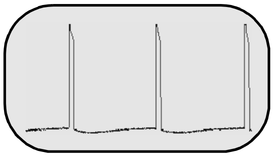
10MHz X'tal

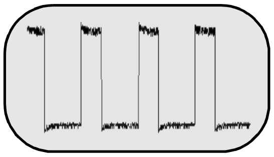
⑥
IC001 PIN 50 (OSC)

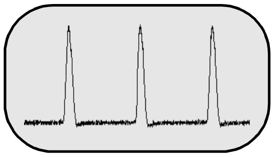

⑦ **800mv Vp-p**
IC451 PIN 1 (VERT IN)

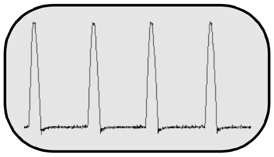

⑧ **3.88 Vp-p**
Q4111 B (V DRIVE)

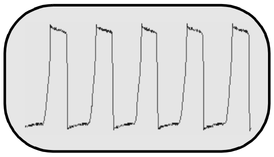

⑨ **56.8 Vp-p**
IC451 PIN 5(V OUT)

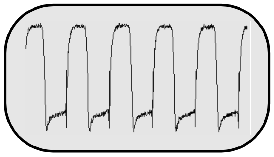

⑩ **31.4 Vp-p**
IC451 PIN 3 (PUMP UP)

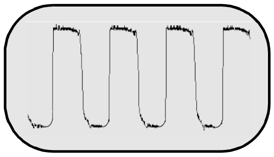

⑪ **3.20 Vp-p**
IC501 PIN 4 (H-DRIVE)


⑫ **26 Vp-p**
A12 PIN 2 (HEATER)

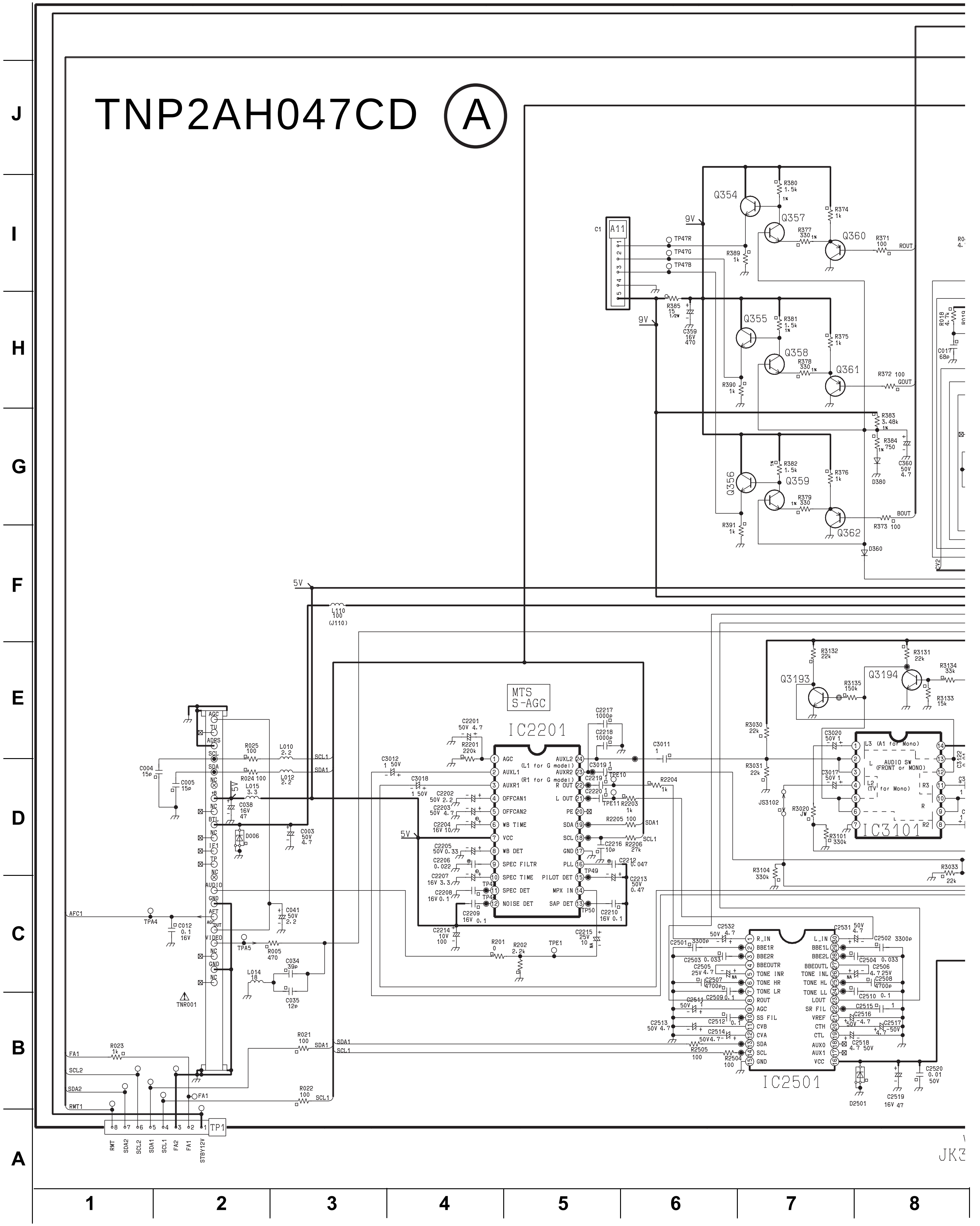

⑬ **1.24 kVp-p**
Q551 Collector (H OUT)


⑭ **392 Vp-p**
IC801 PIN 1

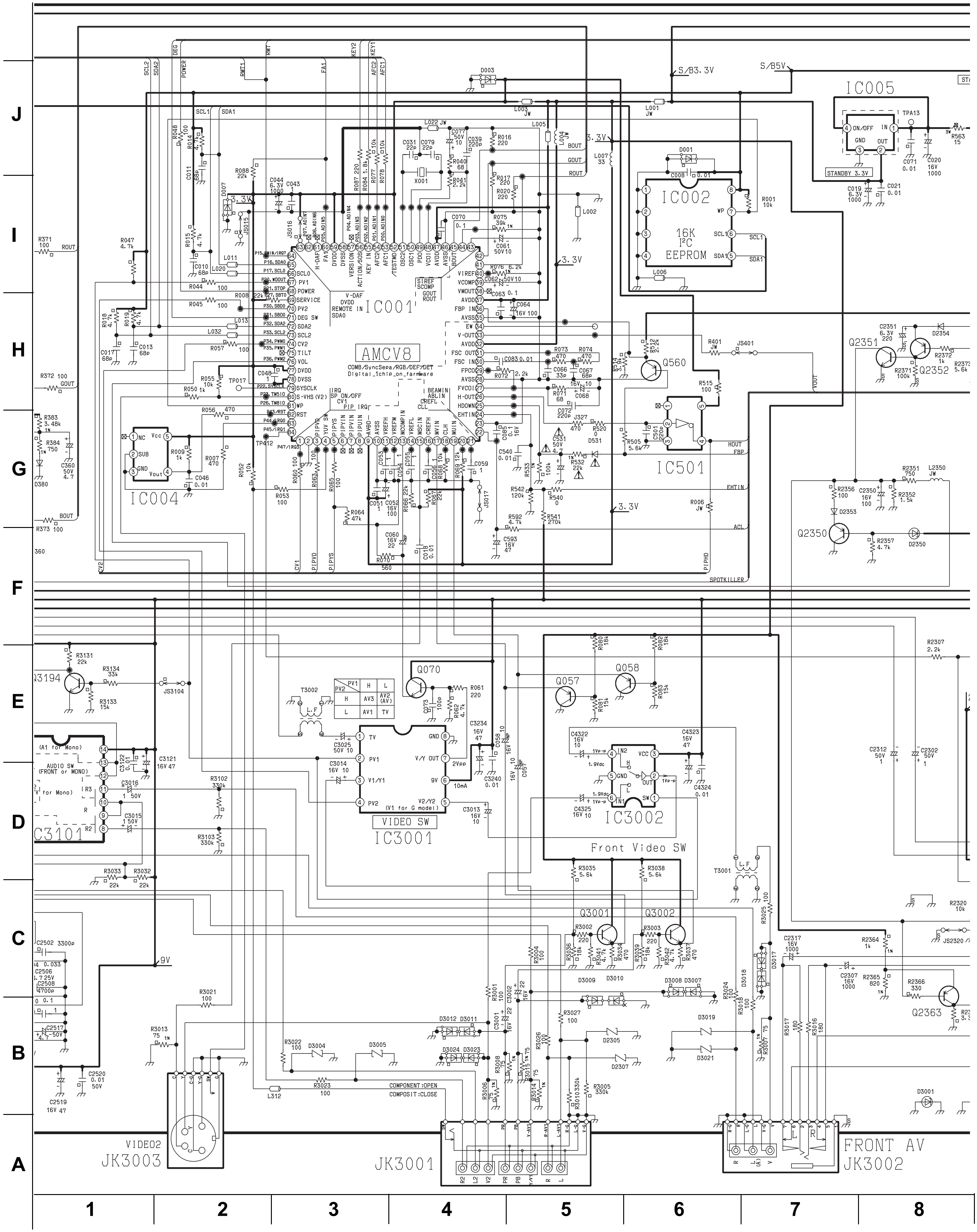

⑮ **2.88 Vp-p**
IC801 PIN 7


⑯ **114 Vp-p**
Q501 Collector

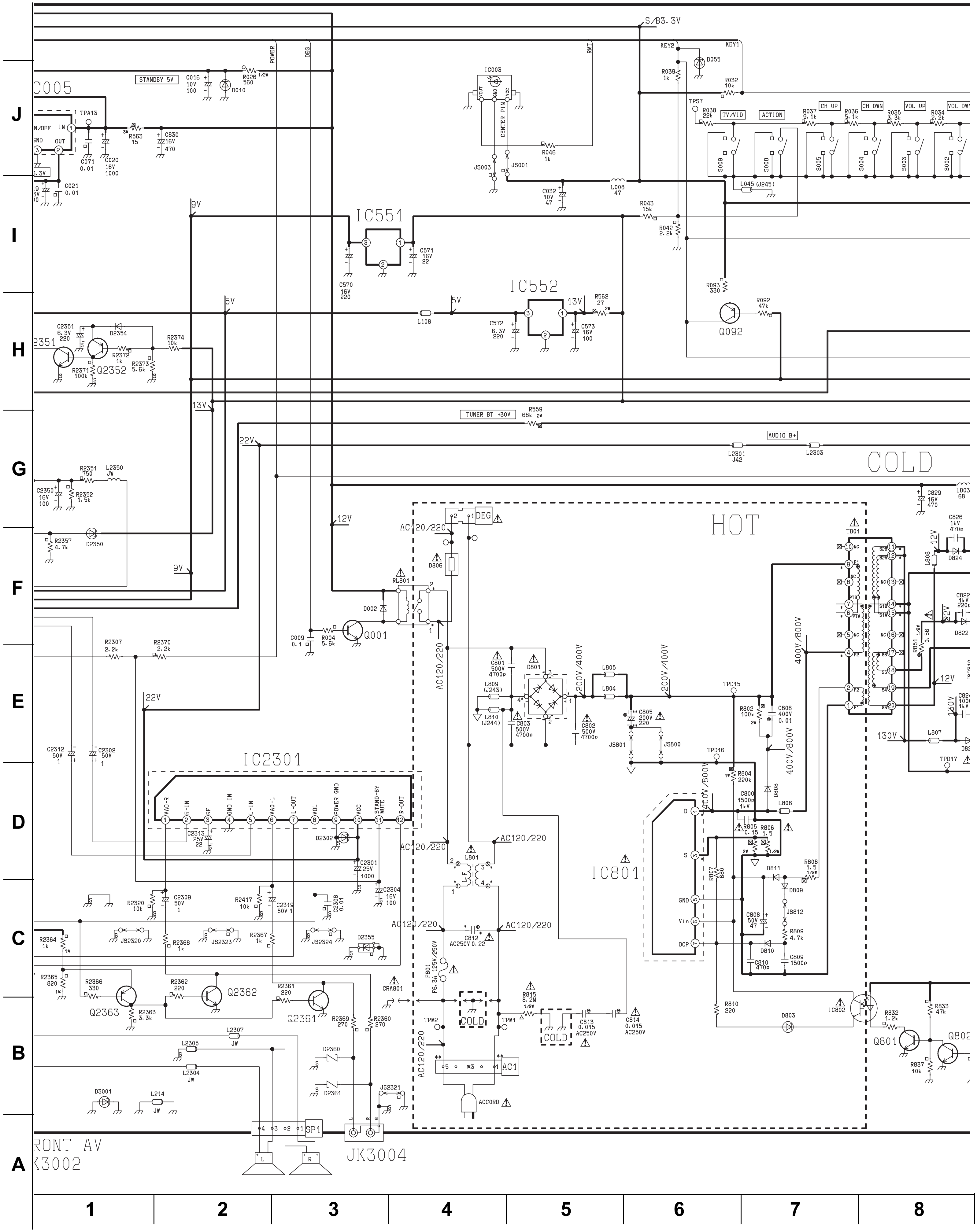
TNP2AH047CD Ⓐ



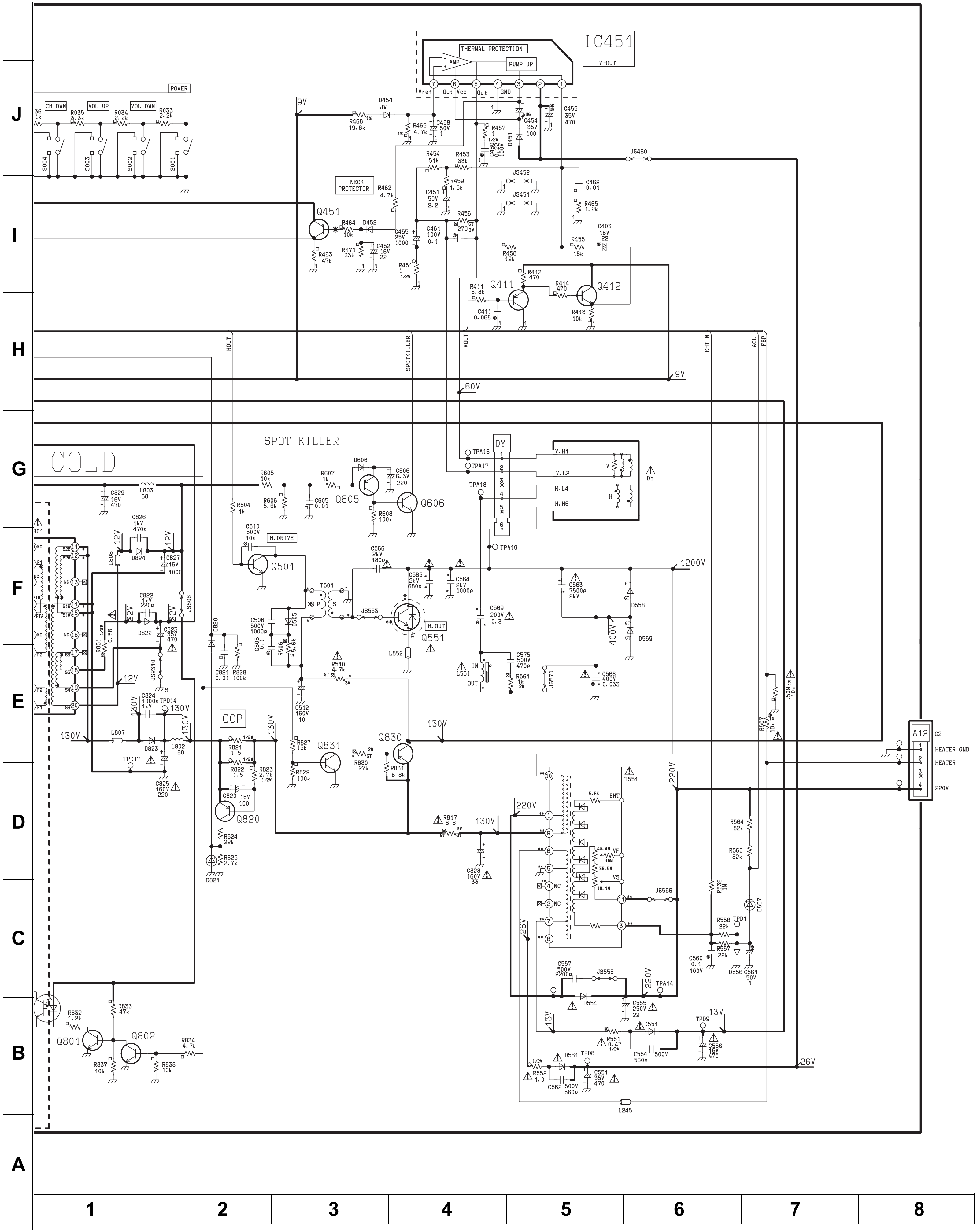
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
C1
A11
TP47R
TP47G
TP47B
9V
Q354
Q355
Q356
Q357
Q358
Q359
Q360
Q361
Q362
R380 1.5k 1%
R381 1.5k 1%
R382 1.5k 1%
R374 1k
R375 1k
R376 1k
R377 330 1%
R378 330 1%
R379 330 1%
R371 100
R372 100
R373 100
ROUT
GOUT
BOUT
R389 1k
R390 1k
R391 1k
R385 15 1/2W
C359 16V 470
R383 3.48k 1%
R384 750 1%
C360 50V 4.7
D380
D360
R018 4.7k
C017 68p
CV2
5V
L110 100 (J110)
MTS S-AGC
IC2201
AGC
AUXL1
AUXR1
OFFCAN1
OFFCAN2
WB TIME
VCC
WB DET
SPEC FILTR
SPEC TIME
SPEC DET
NOISE DET
AUXL2
AUXR2
(L1 for G model)
(R1 for G model)
R OUT
L OUT
PE
SDA
SCL
GND
PLL
PILOT DET
MPX IN
SAP DET
C2201 50V 4.7
R2201 220k
C3012 1 50V
C3018 1 50V
C2202 50V 2.2
C2203 50V 4.7
C2204 16V 10
C2205 50V 0.33
C2206 0.022
C2207 16V 3.3
C2208 16V 0.1
C2209 16V 0.1
C2214 10V 100
C2215 25V 10
C2217 1000p
C2218 1000p
C3019 1
C2219 1
C2220 1
TPE10
TPE11
R2203 1k
R2204 1k
R2205 100
R2206 27k
C2216 10p
C2212 0.047
C2213 50V 0.47
C2210 16V 0.1
TP49
TP50
C3011 1
SDA1
SCL1
R201 0
R202 2.2k
TPE1
AGC
TU
ADRS
SCL
SDA
NC
+B
BTL
IF1
TP
AUDIO
GND
AFT
AGC OUT
VIDEO
R025 100
R024 100
L010 2.2
L012 2.2
C004 15p
C005 15p
L015 3.3
C038 16V 47
D006
C003 50V 4.7
C041 50V 2.2
C012 0.1 16V
AFC1
TPA4
TPA5
R005 470
C034 39p
C035 12p
L014 18
TNR001
FA1
R023 1k
SCL2
SDA2
RMT1
R021 100
R022 100
TP1
RMT
SDA2
SCL2
SDA1
SCL1
FA2
FA1
STBY12V
R3132 22k
R3131 22k
Q3193
Q3194
R3134 33k
R3135 150k
R3133 15k
R3030 22k
R3031 22k
C3020 50V 1
C3017 50V 1
JS3102
R3020 JW
R3101 330k
R3104 330k
R3033 22k
L3 (A1 for Mono)
AUDIO SW (FRONT or MONO)
L2 (TV for Mono)
R3
R2
R
L
IC3101
C3122
IC2501
R_IN
BBE1R
BBE2R
BBEOUTR
TONE INR
TONE HR
TONE LR
ROUT
AGC
SS FIL
CVB
CVA
SDA
SCL
GND
L_IN
BBE1L
BBE2L
BBEOUTL
TONE INL
TONE HL
TONE LL
LOUT
SR FIL
VREF
CTH
CTL
AUX0
AUX1
VCC
C2501 3300p
C2502 3300p
C2503 0.033
C2504 0.033
C2505 25V 4.7
C2506 4.7 25V
C2507 4700p
C2508 4700p
C2509 0.1
C2510 0.1
C2511 50V 1
C2515 1
C2512 0.1
C2516 50V 4.7
C2513 50V 4.7
C2517 4.7 50V
C2514 50V 4.7
C2518 4.7 50V
C2531 50V 4.7
C2532 50V 4.7
R2505 100
R2504 100
C2520 0.01 50V
C2519 16V 47
D2501
NA
JK3

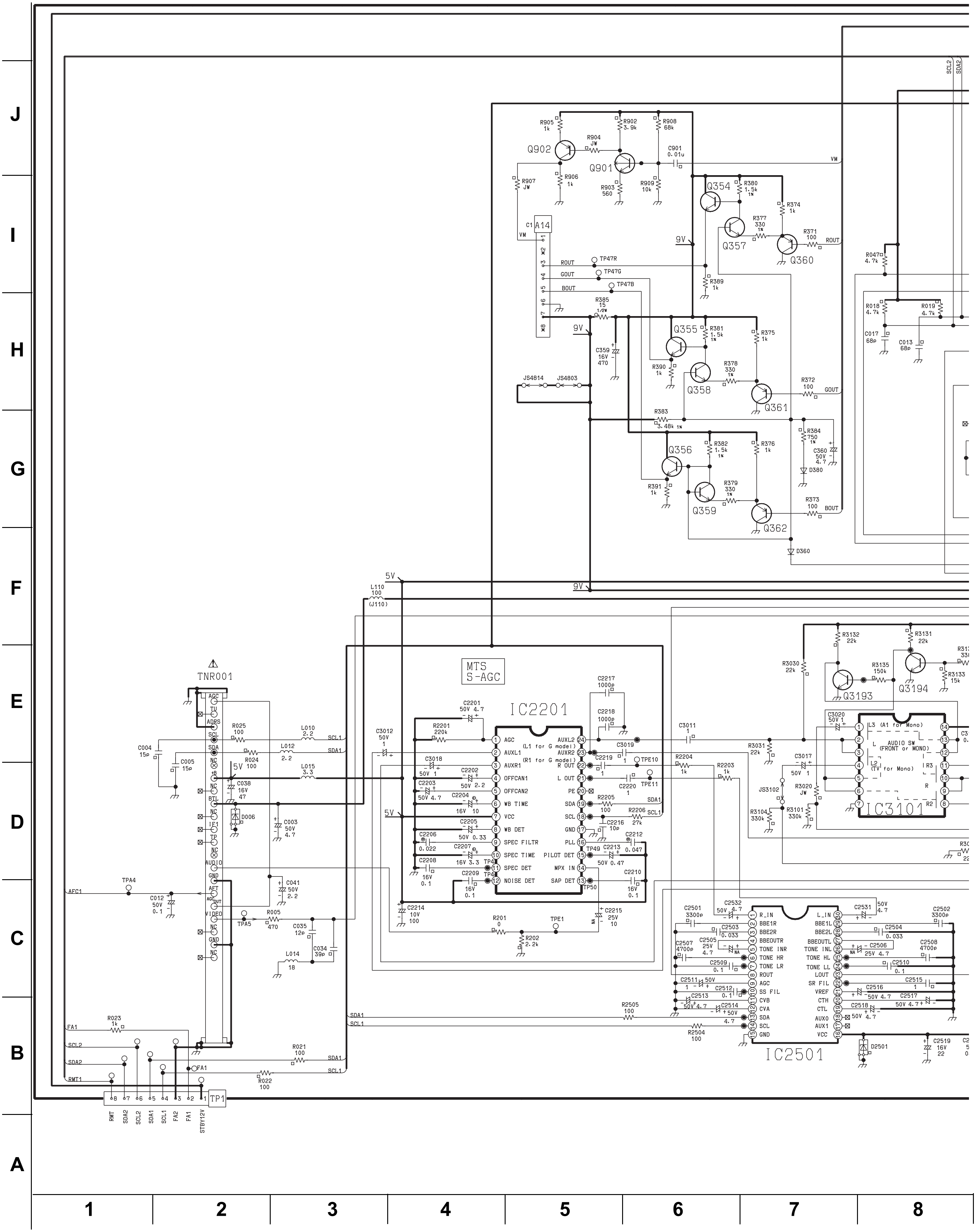

J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
IC001
AMCV8
COMB/SyncSepa/RGB/DEF/DET
Digital_1chip_on_farmware
IC002
16K
I²C
EEPROM
IC004
IC005
STANDBY 3.3V
IC501
IC3001
VIDEO SW
IC3002
Front Video SW
Q560
Q070
Q057
Q058
Q3001
Q3002
Q2350
Q2351
Q2352
Q2363
Q3194
S/B3.3V
S/B5V
3.3V
9V
ROUT
GOUT
BOUT
SCL1
SDA1
SCL2
SDA2
DEG
POWER
RMT
RMT1
FA1
KEY1
KEY2
AFC1
AFC2
HOUT
FBP
EHTIN
ACL
SPOTKILLER
VOUT
CV1
CV2
PIPVD
PIPVS
PIPHD
AUDIO SW
(FRONT or MONO)
(A1 for Mono)
IC3101
T3001
T3002
L.F
COMPONENT:OPEN
COMPOSIT:CLOSE
VIDEO2
JK3003
JK3001
FRONT AV
JK3002

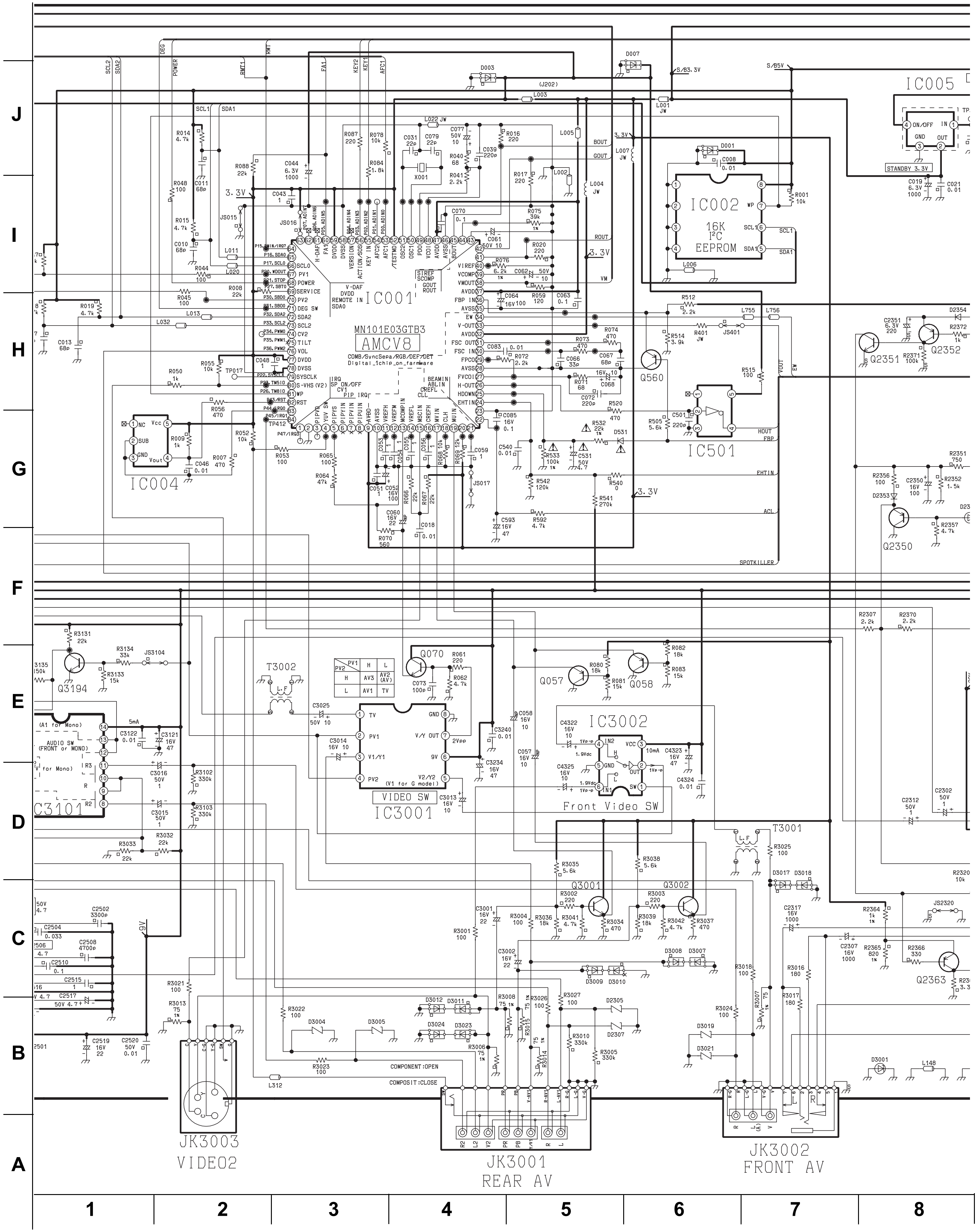
A-BOARD **2 of 4** **TNP2AH047CD** **CT-20SL13G**



S/B3.3V
KEY2
KEY1
D055
R039 1k
R032 10k
TPS7
R038 22k
TV/VID
ACTION
CH UP
CH DWN
VOL UP
VOL DWN
R037 9.1k
R036 5.1k
R035 3.3k
R034 2.2k
S009
S008
S005
S004
S003
S002
L045 (J245)
IC003
CENTER PIN
R046 1k
JS003
JS001
C032 10V 47
L008 47
RMT
POWER
DEG
STANDBY 5V
C016 10V 100
D010
R026 560
C005
TPA13
IN
OUT
GND
R563 15
C830 16V 470
C071 0.01
C020 16V 1000
C021 0.01
9V
IC551
C570 16V 220
C571 16V 22
R043 15k
R042 2.2k
R093 330
Q092
R092 47k
5V
L108
IC552
C572 6.3V 220
C573 16V 100
13V
R562 27
C2351 6.3V 220
D2354
Q2351
Q2352
R2371 100k
R2372 1k
R2373 5.6k
R2374 10k
TUNER BT +30V
R559 68k
22V
AUDIO B+
L2301 J42
L2303
COLD
R2351 750
L2350 JW
C2350 16V 100
R2352 1.5k
C829 16V 470
L803 68
R2357 4.7k
D2350
12V
HOT
DEG
AC120/220
D806
RL801
D002
Q001
C009 0.1
R004 5.6k
R2307 2.2k
R2370 2.2k
C801 500V 4700p
D801
L809 (J243)
L810 (J244)
C803 500V 4700p
C802 500V 4700p
200V/400V
L805
L804
C805 200V 220
JS801
JS800
TPD15
TPD16
R802 100k
C806 400V 0.01
400V/800V
R804 220k
D808
C800 1500p 1kV
L806
T801
L808
D824
C826 1kV 470p
C822 1kV 220p
D822
R851 0.56
130V
L807
TPD17
C2312 50V 1
C2302 50V 1
IC2301
VAO-R
R-IN
RF
GND IN
L-IN
VAO-L
L-OUT
VOL
POWER GND
VCC
STAND-BY MUTE
R-OUT
C2313 25V 22
D2302
C2301 25V 1000
C2304 16V 100
L801
IC801
D
S
GND
Vin
OCP
R805 0.15
R806 1.5
R807 680
D811
D809
R808 1.5
JS812
C808 50V 47
R809 4.7k
D810
C810 470p
C809 1500p
R2320 10k
C2309 50V 1
R2417 10k
C2319 50V 1
C2308 0.01
R2364 1k
JS2320
R2368 1k
JS2323
R2367 1k
JS2324
D2355
C812 AC250V 0.22
F801 F6.3A 125V/250V
CRA801
R2365 820
R2366 330
Q2363
R2363 3.3k
R2362 220
Q2362
R2361 220
Q2361
R2369 270
R2360 270
TPM2
TPM1
R815 8.2M
C813 0.015 AC250V
C814 0.015 AC250V
R810 220
D803
IC802
R832 1.2k
R833 47k
Q801
Q802
R837 10k
L2307 JW
L2305
L2304 JW
D2360
D2361
JS2321
AC1
ACCORD
D3001
L214 JW
SP1
FRONT AV
K3002
JK3004
L
R
G
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8


IC451
V-OUT
THERMAL PROTECTION
AMP
PUMP UP
Vref
Out
Vcc
Out
GND
POWER
CH DWN
VOL UP
VOL DWN
R035 3.3k
R034 2.2k
R033 2.2k
S004
S003
S002
S001
9V
D454 JW
R468 19.6k
R469 4.7k
C458 50V 1
R457 1 1/2W
C460 100V 1
C454 35V 100
D451
C459 35V 470
JS460
R454 51k
R453 33k
JS452
JS451
C462 0.01
R465 1.2k
NECK PROTECTOR
R462 4.7k
R459 1.5k
C451 50V 2.2
R456 270 3W
C461 100V 0.1
Q451
R464 10k
D452
C455 25V 1000
C452 16V 22
R471 33k
R463 47k
R451 1 1/2W
R458 12k
R455 18k
C403 16V 22
R412 470
R414 470
Q411
Q412
R411 6.8k
C411 0.068
R413 10k
HOUT
SPOTKILLER
VOUT
EHTIN
ACL
FBP
60V
SPOT KILLER
COLD
DY
TPA16
TPA17
TPA18
TPA19
V.H1
V.L2
H.L4
H.H6
R605 10k
R607 1k
D606
C606 6.3V 220
Q605
Q606
C829 16V 470
L803 68
R606 5.6k
C605 0.01
R608 100k
R504 1k
C826 1kV 470p
C510 500V 10p
H.DRIVE
Q501
C566 2kV 180p
1200V
C565 2kV 680p
C564 2kV 1000p
C563 7500p 2kV
D558
D559
400V
T501
JS553
Q551
H.OUT
C569 200V 0.3
L808
D824
C827 16V 1000
C822 1kV 220p
D822
C823 35V 470
R851 0.56 1/2W
JS806
D820
C506 500V 1000p
D505
C505 0.1
R506 5.6k 1W
L552
C575 500V 470p
R561 1k 2W
JS570
C568 400V 0.033
L551
IN
OUT
C821 0.01
R828 100k
JS2310
R510 4.7k 3W
C512 160V 10
12V
130V
C824 1000p 1kV
TPD14
OCP
R509 10k
R507 18k
A12
HEATER GND
HEATER
220V
L807
D823
L802 68
R821 1.5 1/2W
R822 1.5 1/2W
R823 2.7k 1/2W
R827 15k
Q831
R830 27k
Q830
R831 6.8k
R829 100k
TPD17
C825 160V 220
C820 16V 100
Q820
R824 22k
R825 2.7k
D821
R817 6.8 3W
C828 160V 33
T551
5.6K
EHT
43.4M
15M
VF
38.5M
18.1M
VS
NC
JS556
R539 1M
R564 82k
R565 82k
D557
R558 22k
TPD1
R557 22k
C560 0.1 100V
D556
C561 50V 1
26V
C557 500V 2200p
JS555
D554
C555 250V 22
TPA14
13V
R551 0.47 1/2W
D551
TPD9
C554 560p 500V
C556 16V 470
R552 1.0 1/2W
D561
TPD8
C551 35V 470
C562 500V 560p
L245
R832 1.2k
R833 47k
Q801
Q802
R834 4.7k
R837 10k
R838 10k
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8


J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
SCL2
SDA2
R905
1k
R902
3.9k
R908
68k
Q902
R904
JW
C901
0.01u
VM
Q901
R907
JW
R906
1k
R903
560
R909
10k
Q354
R380
1.5k
1%
R374
1k
C1
A14
VM
R377
330
1%
R371
100
ROUT
9V
Q357
Q360
R047
4.7k
ROUT
TP47R
GOUT
TP47G
R389
1k
BOUT
TP47B
R385
15
1/2W
R018
4.7k
R019
4.7k
9V
Q355
R381
1.5k
1%
R375
1k
C359
16V
470
C017
68p
C013
68p
R390
1k
R378
330
1%
JS4814
JS4803
Q358
R372
100
GOUT
Q361
R383
3.48k 1%
R384
750
1%
R382
1.5k
1%
R376
1k
C360
50V
4.7
Q356
D380
R391
1k
R379
330
1%
Q359
R373
100
BOUT
Q362
D360
5V
9V
L110
100
(J110)
R3132
22k
R3131
22k
R3030
22k
R3135
150k
R3133
15k
Q3193
Q3194
MTS
S-AGC
TNR001
AGC
TU
ADRS
SCL
SDA
NC
+B
NC
BTL
NC
IF1
TP
NC
AUDIO
GND
AFT
AGC OUT
VIDEO
NC
GND
NC
IC2201
C2201
50V 4.7
R2201
220k
C2217
1000p
C2218
1000p
C3011
1
C3020
50V 1
L3 (A1 for Mono)
AUDIO SW
(FRONT or MONO)
L2 (TV for Mono)
R3
R
R2
IC3101
R025
100
L010
2.2
SCL1
C004
15p
C005
15p
R024
100
L012
2.2
SDA1
5V
L015
3.3
C038
16V
47
C3012
50V
1
AGC
AUXL1
AUXR1
OFFCAN1
OFFCAN2
WB TIME
VCC
WB DET
SPEC FILTR
SPEC TIME
SPEC DET
NOISE DET
AUXL2
(L1 for G model)
AUXR2
(R1 for G model)
R OUT
L OUT
PE
SDA
SCL
GND
PLL
PILOT DET
MPX IN
SAP DET
C3018
50V 1
C2202
50V 2.2
C2203
50V 4.7
C2204
16V 10
C2205
50V 0.33
C2206
0.022
C2207
16V 3.3
C2208
16V
0.1
C2209
16V
0.1
TP4
C3019
1
TPE10
C2219
1
TPE11
C2220
1
R2204
1k
R2203
1k
R3031
22k
C3017
50V 1
JS3102
R3020
JW
R3104
330k
R3101
330k
R2205
100
R2206
27k
SDA1
SCL1
C2216
10p
C2212
0.047
TP49
C2213
50V 0.47
C2210
16V
0.1
TP50
D006
C003
50V
4.7
C041
50V
2.2
AFC1
TPA4
C012
50V
0.1
TPA5
R005
470
C035
12p
C034
39p
L014
18
C2214
10V
100
R201
0
TPE1
R202
2.2k
C2215
25V
10
NA
C2501
3300p
C2532
50V 4.7
C2531
50V
4.7
C2502
3300p
C2503
0.033
C2504
0.033
C2507
4700p
C2505
25V
4.7
NA
C2506
25V 4.7
NA
C2508
4700p
C2509
0.1
C2510
0.1
C2511
50V 1
C2512
0.1
C2515
1
C2516
50V 4.7
C2513
50V 4.7
C2517
50V 4.7
C2514
50V
4.7
C2518
50V 4.7
R_IN
BBE1R
BBE2R
BBEOUTR
TONE INR
TONE HR
TONE LR
ROUT
AGC
SS FIL
CVB
CVA
SDA
SCL
GND
L_IN
BBE1L
BBE2L
BBEOUTL
TONE INL
TONE HL
TONE LL
LOUT
SR FIL
VREF
CTH
CTL
AUX0
AUX1
VCC
IC2501
R2505
100
R2504
100
SDA1
SCL1
D2501
C2519
16V
22
FA1
R023
1k
SCL2
SDA2
RMT1
R021
100
SDA1
FA1
R022
100
SCL1
TP1
RMT
SDA2
SCL2
SDA1
SCL1
FA2
FA1
STBY12V



J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
SCL2
SDA2
DEG
POWER
RMT1
RMT
FA1
KEY2
KEY1
AFC1
D003
(J202)
L003
D007
S/B3.3V
S/B5V
IC005
ON/OFF
IN
GND
OUT
STANDBY 3.3V
C019 6.3V 1000
C021 0.01
L001 JW
SCL1
SDA1
R014 4.7k
R048 100
C011 68p
R088 22k
C044 6.3V 1000
R087 220
R078 10k
R084 1.8k
L022 JW
C031 22p
C079 22p
X001
C077 50V 10
R040 68
R041 2.2k
C039 220p
R016 220
L005
BOUT
GOUT
L007 JW
D001
C008 0.01
IC002
16K
I²C
EEPROM
WP
R001 10k
L006
3.3V
C043 1
R015 4.7k
JS015
JS016
C010 68p
L011
L020
R044 100
R045 100
R008 22k
R017 220
L002
L004 JW
C070 0.1
R075 39k 1%
C061 50V 10
R020 220
R076 6.2k 1%
C062 50V 10
R059 120
C063 0.1
C064 16V 100
ROUT
VM
IC001
MN101E03GTB3
AMCV8
COMB/SyncSepa/RGB/DEF/DET
Digital_1chip_on_farmware
V-DAF
DVDD
REMOTE IN
SDA0
SIREF
SCOMP
GOUT
ROUT
IRQ
SP ON/OFF
CV1
PIP IRQ
BEAMIN
ABLIN
CREFL
CLL
R019 4.7k
L032
L013
C013 68p
R055 10k
TP017
C048 1
R050 1k
R056 470
R052 10k
TP412
R053 100
R065 100
R064 47k
R512 2.2k
L755
L756
R401 JW
JS401
R514 3.9k
Q560
C083 0.01
R072 2.2k
R073 470
R074 470
C066 33p
C067 68p
R071 68
C068 16V 10
C072 220p
R520 470
R515 100
VOUT
EW
IC501
R505 5.6k
C501 220p
HOUT
FBP
R532 22k 1%
D531
C540 0.01
R533 100k 1%
C531 50V 4.7
C085 16V 0.1
C059 1
JS017
R540 0
R542 120k
R541 270k
EHTIN
ACL
C593 16V 47
R592 4.7k
SPOTKILLER
C051 1
C052 16V 100
C053
C054
C055
C056
R066 22k
R067 22k
R068 10k
R069 12k
C060 16V 22
R070 560
C018 0.01
IC004
NC
Vcc
SUB
GND
Vout
R009 1k
C046 0.01
R007 470
D2354
C2351 6.3V 220
R2372 1k
Q2351
Q2352
R2371 100k
R2351 750
R2356 100
C2350 16V 100
R2352 1.5k
D2353
Q2350
R2357 4.7k
R2307 2.2k
R2370 2.2k
R3131 22k
R3135 150k
R3134 33k
JS3104
R3133 15k
Q3194
T3002
L.F
Q070
R061 220
R062 4.7k
C073 100p
PV1 / PV2 / H / L / AV3 / AV2 (AV) / AV1 / TV
Q057
R080 18k
R081 15k
R082 18k
R083 15k
Q058
(A1 for Mono)
AUDIO SW (FRONT or MONO)
5mA
C3122 0.01
C3121 16V 47
C3016 50V 1
R3102 330k
C3015 50V 1
R3103 330k
IC3101
R3032 22k
R3033 22k
C3025 50V 10
TV
PV1
V1/Y1
PV2
GND
V/Y OUT
2Vpp
9V
V2/Y2
(V1 for G model)
C3014 16V 10
VIDEO SW
IC3001
C3013 16V 10
C3240 0.01
C3234 16V 47
C058 16V 10
C057 16V 10
IC3002
C4322 16V 10
C4325 16V 10
IN2
VCC
GND
OUT
IN1
SW
10mA
C4323 16V 47
C4324 0.01
1Vp-p
1.9Vdc
Front Video SW
T3001
R3025 100
R3035 5.6k
R3038 5.6k
Q3001
Q3002
R3002 220
R3003 220
R3004 100
R3036 18k
R3041 4.7k
R3034 470
R3039 18k
R3042 4.7k
R3037 470
C3001 16V 22
R3001 100
C3002 16V 22
D3009
D3010
D3008
D3007
D3017
D3018
C2317 16V 1000
C2307 16V 1000
R2364 1k 1%
R2365 820 1%
R2366 330
Q2363
JS2320
R2320 10k
C2312 50V 1
C2302 50V 1
C2502 3300p
C2504 0.033
C2508 4700p
C2510 0.1
C2515 1
C2517 50V 4.7
C2519 16V 22
C2520 50V 0.01
9V
R3021 100
R3013 75 1%
R3022 100
D3004
D3005
R3023 100
L312
COMPONENT:OPEN
COMPOSIT:CLOSE
D3012
D3011
D3024
D3023
R3008 75 1%
R3026 100
R3015 75 1%
R3027 100
R3014 75
R3006 75 1%
R3010 330k
R3005 330k
D2305
D2307
R3018 100
R3016 180
R3017 180
R3007 75 1%
R3024 100
D3019
D3021
D3001
L148
JK3003
VIDEO2
JK3001
REAR AV
R2 L2 V2 PR PB Y/V1 R L
JK3002
FRONT AV
R L (A) V

MTNC030623C1

B01/B05

Service Manual

Color Television

CT-25L8G / CT-25L8UG / CT-20L8G / CT-20G8G / CT-20G8SG

NA10

Copyright 2003 Matsushita Electric Corporation of America. All rights reserved. Unauthorized copying and distribution is a violation of law.

⚠ WARNING

This service information is designed for experienced repair technicians only and is not designed for use by the general public. It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product. Products powered by electricity should be serviced or repaired only by experienced professional technicians. Any attempt to service or repair the product or products dealt with in this service information by anyone else could result in serious injury or death.

Panasonic®

IMPORTANT SAFETY NOTICE

There are special components used in this equipment which are important for safety. These parts are marked by ⚠ in the Schematic Diagrams, Circuit Board Diagrams, Exploded Views and Replacement Parts List. It is essential that these critical parts should be replaced with manufacturer's specified parts to prevent shock, fire or other hazards. Do not modify the original design without permission of manufacturer.

1. Safety precautions

General guidelines

An isolation transformer should always be used during the servicing of a receiver whose chassis is not isolated from AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injuryfrom electrical shocks. It will also protect the receiver from being damaged by accidental shorting that may occur during servicing. When servicing, observe the original lead dress, especially in the high voltage circuit. Replace all damaged parts (also parts that show signs of overheating.)

Always replace protective devices, such as fish paper, isolation resistors and capacitors, and shields after servicing the receiver. Use only manufacturer's recommended rating for fuses, circuits breakers, etc.

High potentials are present when this receiver is operating. Operation of the receiver without the rear cover introduces danger for electrical shock. Servicing should not be performed by anyone who is not thoroughly familiar with the necessary precautionswhen servicing high voltage equipment.

Extreme care should be practiced when handling the picture tube. Rough handling may cause it to implode due to atmospheric pressure. (14.7 lbs per sq. in.). Do not nick or scratch the glass or subject it to any undue pressure. When handling, usesafety goggles and heavy gloves for protection. Discharge the picture tube by shorting the anode to chassis ground (not to the cabinet or to other mounting hardware). When discharging connect cold ground (i.e. dag ground lead) to the anode with a wellinsulated wire or use a grounding probe.Avoid prolonged exposure at close range to unshielded areas of the picture tube to prevent exposure to x ray radiation.

The test picture tube used for servicing the chassis at the bench should incorporate safety glass and magnetic shielding. The safety glass provide shielding for the tube viewing area against x ray radiation as well as implosion. The magnetic shieldlimits the x ray radiation around the bell of the picture tube in addition to the restricting magnetic effects. When using a picture tube test jig for service, ensure that the jig is capable of handling 50kV without causing x ray radiation.

Before returning a serviced receiver to the owner, the service technician must thoroughly test the unit to ensure that is completely safe to operate. Do not use a line isolation transformer when testing.

Leakage current cold check

Unplug the A.C. cord and connect a jumper between the two plug prongs.Measure the resistance between the jumpered AC plug and expose metallic parts such as screwheads, antenna terminals, control shafts, etc. If the exposed metallic part has a returnpath to the chassis, the reading should be between 240k Ω and 5.2M Ω . If the exposed metallic part does not have a return path to the chassis, the reading should be infinite.

Leakage current hot check

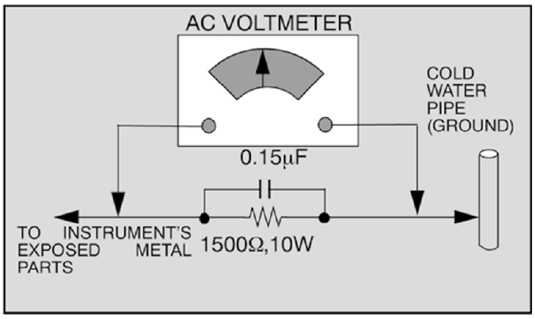
Plug the AC cord directly into the AC outlet. Do not use an isolation transformer during the check. Connect a 1.5k Ω 10 watt resistor in parallel with a 0.15 μ F capacitor between an exposed metallic part and ground. Use earth ground, for example a water pipe.

Using a DVM with a 1000 ohms/volt sensitivity or higher, measure the AC potential across the resistor.

Repeat the procedure and measure the voltage present with all other exposed metallic parts. Verify that any potential does not exceed 0.75 volt RMS. A leakage current tester (such a Simpson model 229, Sencore model PR57 or equivalent) may be used in the above procedure, in which case any current measure must not exceed 0.5 milliamp. Ifany measurement is out of the specified limits, there is a possibility of a shock hazard and the receiver must be repaired and

rechecked before it is returned to the customer.

Hot check circuit



Insulation test

Connect an insulation tester between an exposed metallic part and A.C. line. Apply 1080VAC/ 60Hz for 1 second. Confirm that the current measurement is 0.5mA ~ 2.0mA. Repeat test with other metallic exposed parts.

X ray radiation

WARNING

The potential source of x ray radiation in the TV set is in the high voltage section and the picture tube.

NOTE

It is important to use an accurate, calibrated high voltage meter.

Set the brightness, picture, sharpness and color controls to minimum.
Measure the high voltage. The high voltage should be 27.70 ± 1.25kV for 20" models and 29.25 ± 1.25kV for 25" models . If the upper limit is out of tolerance, immediate serviceand correction is required to insure safe operation and to prevent the possibility of premature component failure.

Horizontal oscillator disable circuit test

This test must be performed as a final check before the receiver is returned to the customer. See horizontal oscillator disable circuit procedure check in this manual.

2. Service notes

NOTE

These components are affixed with glue. Be careful not to break or damage any foil under the component or at the pins of the ICs when removing. Usually applying heat to the component for a short time while twisting with tweezers will break the component loose.

Leadless chip component (surface mount)

Chip components must be replaced with identical chips due to critical foil track spacing. There are no holes in the board to mount standard transistors or diodes. Some chips capacitor or resistor board solder pads may have holes through the board,however the hole diameter limits standard resistor replacement to 1/8 watt. Standard capacitor may also be limited for the same reason. It is recommended that identical components be used.

Chip resistor have a three digit numerical resistance code, 1st and 2nd significant digits and a multiplier. Example: 162 = 1600 or 1.6k Ω resistor, 0 = 0 Ω (jumper).

Chip capacitors generally do not have the value indicated on the capacitor. The color of the component indicates the general range of the capacitance.

Chip transistors are identified by a two letter code. The first letter indicates the type and the second letter, the grade of transistor.

Chip diodes have a two letter identification code as per the code chart and are a dual diode pack with either common anode or common cathode. Check the parts list for correct diode number.

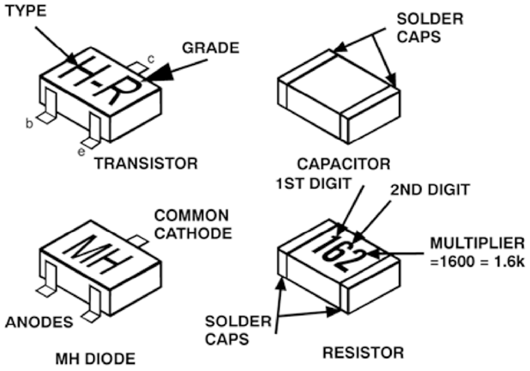
Component removal

1. **Use solder wick to remove solder from component end caps or terminal.**
2. **Without pulling up, carefully twist the component with tweezers to break the adhesive.**
3. **Do not reuse removed leadless or chip components since they are subject to stress fracture during removal.**

Chip component installation

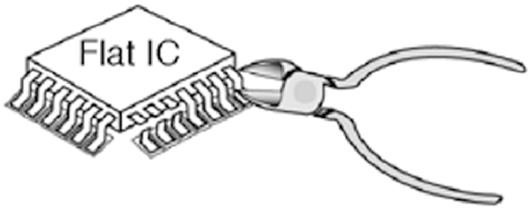
1. **Put a small amount of solder on the board soldering pads.**
2. **Hold the chip component against the soldering pads with tweezers or with a miniature alligator clip and apply heat to the pad area with a 30 watt iron until solder flows. Do not apply heat for more than 3 seconds.**

Chip components

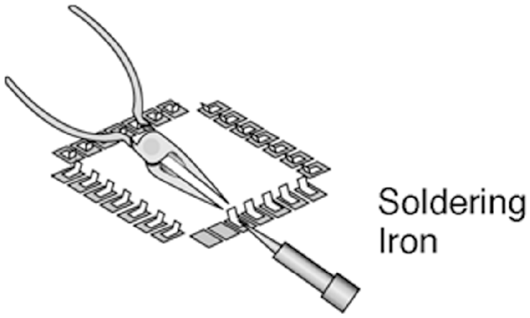

TYPE
GRADE
H-R
c
b
e
TRANSISTOR
SOLDER CAPS
CAPACITOR
1ST DIGIT
2ND DIGIT
MULTIPLIER =1600 = 1.6k
162
COMMON CATHODE
MH
ANODES
MH DIODE
SOLDER CAPS
RESISTOR

How to replace flat ic (required tools)

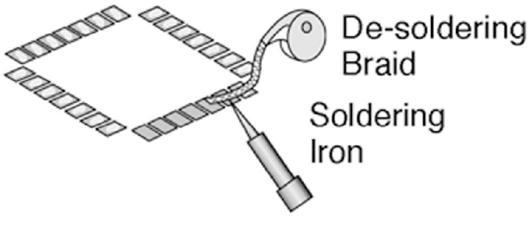
1. **Remove the solder from all of the pins of a Flat IC by using a desolder braid**



2. **Put the iron wire under the pins of the Flat IC and pull it in the direction indicated while heating the pins using a soldering iron. A small awl can be used instead of the iron wire.**

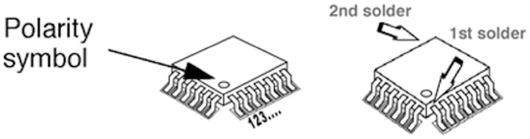

Soldering Iron

3. **Remove the solder from all the pads of the Flat IC by using a de solder braid**

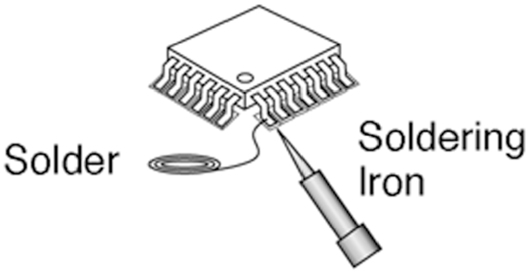

De-soldering Braid
Soldering Iron

4. **Position the new Flat IC in place (apply the pins of the Flat IC to**

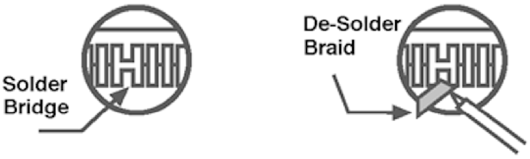
the soldering pads where the pins need to be soldered). Properly determine the positions of the soldering pads and pins by correctly aligning the polarity symbol



5. Solder all pins to the soldering pads using a fine tipped soldering iron



6. Check with a magnifier for solder bridge between the pins or for dry joint between pins and soldering pads. To remove a solder bridge, use a de solder braid as shown in the figure below



IMPORTANT

To protect against possible damage to the solid state devices due to arching or static discharge, make certain that all ground wires and CRT DAG wire are securely connected.

CAUTION

The power supply circuit is above earth ground and the chassis cannot be polarized. Use an isolation transformer when servicing the receiver to avoid damage to the test equipment or to the chassis. Connect the test equipment to the proper ground(hot) or (cold) when servicing, or incorrect voltages will be measured.

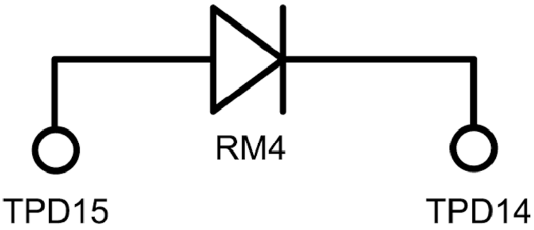
2.1. X-Ray Protection Circuit Check& Adjustments

This test must be performed as final check before the receiver is returned to the customer. If voltages are out of tolerance, immediate service and correction is required to insure safe operation and to prevent the possibility of premature componentfailure.

Equipment:

1. Isolation transformer.
2. High voltage meter.
3. D.C. Ammeter
4. Short jumper.
5. HHS jig (See figure below).

Diode Connection Jumper.



Preparation:

1. Make sure the receiver is turned off.
2. Connect the receiver to an isolation transformer.
3. Connect the ammeter serial from the flyback anode lead to the picture tube anode socket.
4. Prepare short jumper and HHS jig.

Procedure:

1. Connect the short jumper between TPD16 & TPD17.
2. Connect the jumper diode between TPD14 and TPD15 (anode connected to TPD15 and cathode to TPD14).
3. Apply 75VAC to AC input of isolation transformer.
4. Turn the receiver on.
5. Apply a monoscope pattern.
6. Set customer picture and brightness controls to the minimum.
7. tSet current within 50 μ A to 100 μ A by changing the picture and bright controls.

8. Slowly increase AC voltage at the input of the isolation transformer and confirm HHS voltage measure 31kV for 20” models and 33kV for 25” models.
9. Turn power off and remove jigs.

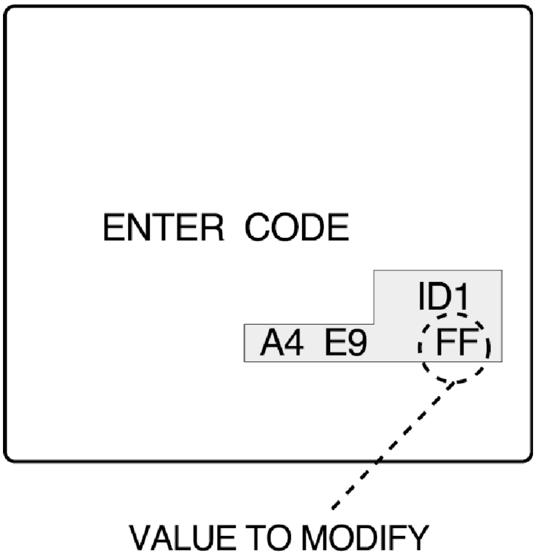
3. EEPROM replacement

If a new EEPROM integrated circuit is replaced for servicing, follow the next procedure once that the memory is properly assembled:

1. Turn the TV set ON.
2. Enter to service mode.
3. Once inside service mode the first image that appears on-screen is the ID1 register with the respective address value (FF) like the image below.

   Note:

   All 3 registers (ID1,ID2,ID3) should appear with FF values if a new EEPROM is assembled.



4. With “VOL” keys adjust the correct value according with the service adjustment table (see “Service Mode” section in page 15).
5. Change to the next ID switch register with “CH” keys and repeat the same procedure as step 4.
6. When replacing a new EEPROM be sure to set the correct ID switch values for each model.

7. Once that all 3 registers are set with the correct address value, perform all of the remaining adjustments and servicing.

IMPORTANT:

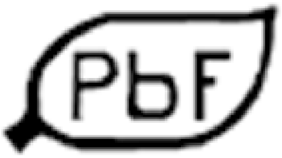
Correct ID switch configuration should be input when replacing EEPROM for each television model, otherwise if wrong values are configured, the television software will not function accordingly and properly.

4. About lead free solder (PbF)

NOTE

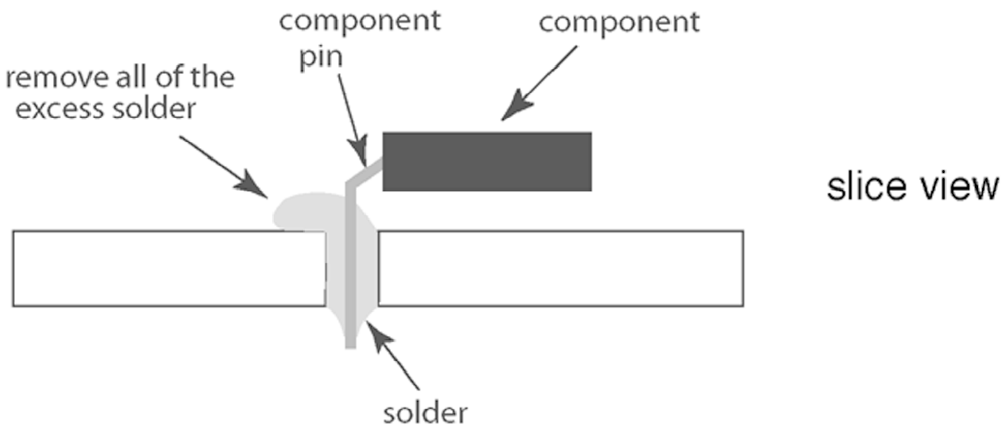
Lead is listed as (Pb) in the periodic table of elements. / In the information below, Pb will refer to lead solder, and PbF will refer to Lead Free Solder. / The lead free solder used in our manufacturing process and discussed below is (Sn+Ag+Cu). / Thatis Tin (Sn), Silver (Ag) and Copper (Cu) although other types are available.

This model uses Pb Free solder in it’s manufacture due to environmental conservation issues. For / service and repair work, we’d suggest the use of Pb free solder as well, although Pb solder may be / used. / PCBs manufacturedusing lead free solder will have the “PbF” or a leaf symbol stamped on the / back of PCB.



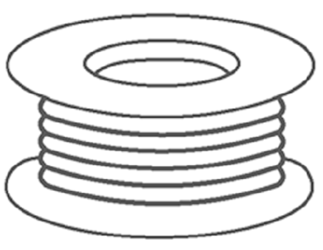
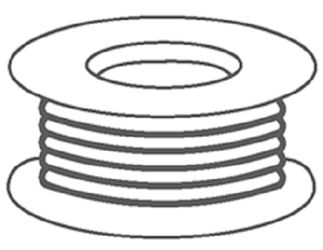
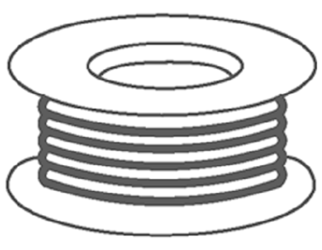
CAUTION

- Pb free solder has a higher melting point than standard solder. Typically the melting point is 50 ~ 70 °F (30 ~ 40 °C) higher. Please use a high temperature soldering iron and set it to 700 ± 20 °F (370 ± 10 °C).
- Pb free solder will tend to splash when heated too high (about 1100 °F or 600 °C). / If you must use Pb solder, please completely remove all of the Pb free solder on the pins or solder area before applying Pb solder. If thisis not practical, be sure to heat the Pb free solder until it melts, before applying Pb solder.
- After applying PbF solder to double layered boards, please check the component side for excess solder which may flow onto the opposite side.


component
pin
component
remove all of the
excess solder
slice view
solder

Suggested Pb free solder

There are several kinds of Pb free solder available for purchase. This product uses Sn+Ag+Cu (tin, silver, copper) solder. However, Sn+Cu (tin, copper), Sn+Zn+Bi (tin, zinc, bismuth) solder can also beused.

0.3mm X 100g	0.6mm X 100g	1.0mm X 100g
		

5. Receiver feature table

FEATURE/MODEL	CT-25L8G/UG	CT-20L8G	CT-20G8G/SG
CHASSIS	AP403	BP398	AP398
MICRO	128K		
MENU LANGUAGE	ENG/SPAN/FR		
CLOSED CAPTION	X		
V-CHIP (USA/CANADA)	X		
CHANNEL COUNT	181		
REMOTE CONTROL	EUR7713010		
CRT SUPPLIER	PANABLACK, SAMSUNG		
CHASSIS	NA10		
COMB FILTER	DIGITAL		
V/A NORM (X=BOTH)	V		
MTS/SAP/DBX	X		
BUILT-IN AUDIO POWER	1.5Wx2 (10%)		
No. OF SPEAKERS	2		
AI SOUND	X		
A/V IN (REAR/FRONT)	2(2/1)		1(1/1)
COMPONENT INPUT (Y, Pb, Pr)	1	----	
S-VIDEO INPUT (REAR/FRONT)	2/1	1/0	

Note:
Specifications are subject to change without notice or obligation. Dimensions and weights are approximate.

6. Board description table

CT-20G8/CT-20G8S

BOARD	PART NUMBER	DESCRIPTION
A	TNP2AH047AA	MAIN BOARD
C	TNP2AA122AA	CRT BOARD

CT-20L8G

BOARD	PART NUMBER	DESCRIPTION
A	TNP2AH047AB	MAIN BOARD
C	TNP2AA122AA	CRT BOARD

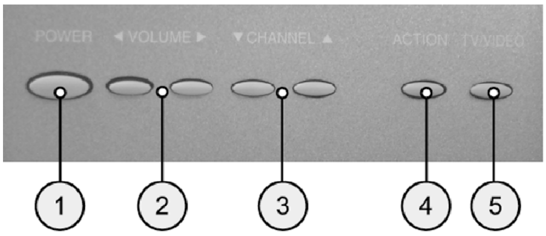
CT-25L8G/CT-25L8UG

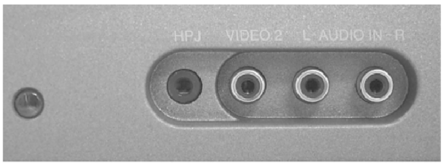
BOARD	PART NUMBER	DESCRIPTION
A	TNP2AH047FA	MAIN BOARD
C	TNP2AA122FA	CRT BOARD

NOTE
When ordering a replacement board assembly, append an “S” to the board number

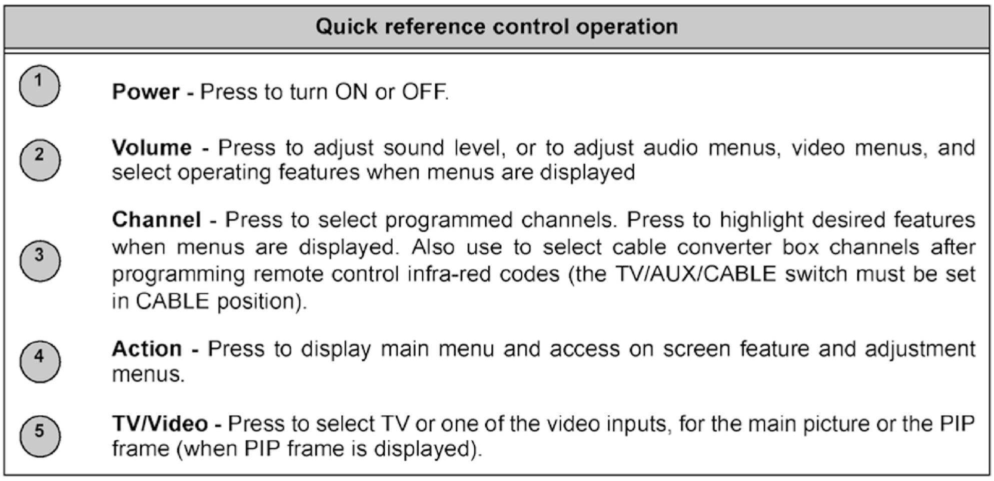
EXAMPLE
To order the A Board, the replacement board is TNP2AH047AAS.

7. TV Location of controls


POWER
◄ VOLUME ►
▼CHANNEL ▲
ACTION
TV/VIDEO
1
2
3
4
5


HPJ
VIDEO 2
L AUDIO IN R

IR Sensor
& Front A/V jacks



Quick reference control operation

① **Power -** Press to turn ON or OFF.

② **Volume -** Press to adjust sound level, or to adjust audio menus, video menus, and select operating features when menus are displayed

③ **Channel -** Press to select programmed channels. Press to highlight desired features when menus are displayed. Also use to select cable converter box channels after programming remote control infra-red codes (the TV/AUX/CABLE switch must be set in CABLE position).

④ **Action -** Press to display main menu and access on screen feature and adjustment menus.

⑤ **TV/Video -** Press to select TV or one of the video inputs, for the main picture or the PIP frame (when PIP frame is displayed).

8. Location of controls (EUR7713010 remote)

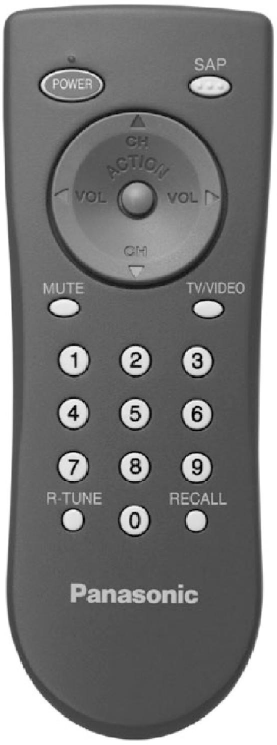
POWER
Press to turn ON and OFF.

VOL
Press to adjust TV sound and navigate in menus.

MUTE
Press to mute sound.

KEYBOARD
Press to select any channel.

R-TUNE
Press to switch to previously viewed channel or video mode.



SAP
Press to acces the secondary audio program broadcast.

CH
Press to select next or previous channel and navigate in menus.

TV/VIDEO
Press to select TV, Video mode.

RECALL
Press to display time, channel sleep timer and other options.

Note:
For additional information about this remote please refer to the owner's manual section remote operation, listed on the parts list section.

9. Dissasembly for service

Back cover

Remove all the screws marked with an arrow (←) from the back of the receiver

NOTE

Screw configuration, type, and number of screws vary depending on the model of the receiver serviced and the application; variou's models are covered in this manual. Use same hardware when reassembling the receiver.

- **3 screws at the top edge of the receiver (for 25" sets).**
- **2 screws at the top edge of the receiver (for 20" sets).**
- **1 screw by the A/V jacks.**
- **1 screw at each lower corner of the receiver.**
- **1 screw by the Flyback.**

A-Board - Main chassis

1. **Slide the chassis completely out of the guide rails.**
2. **Stand the receiver on its edge. The underside of the board is completely accessible for component replacement.**

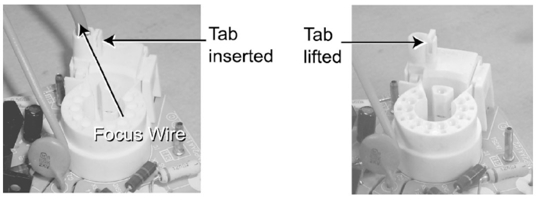
Note:

Some tie-wraps that secure the wire dressings may need to be unfastened for chassis removal.

C-Board - CRT output

The board plugs onto the socket on the CRT neck. To release the Focus wire, use a dull object to release the tab on the socket (near the wire opening) and carefully pull on the wire. To connect the focus wire, press on the tab to lock it then insertthe wire in the opening and press on it until it is fully inserted and locked in place.

Focus cable release



Speakers

Each speaker is secured to the cabinet with 4 screws.

NOTE

When reassembling speakers be sure to connect the speaker wires to the correct speaker lead (+) (-)

9.1. Disassembly for CRT replacement

1. **Discharge the CRT as instructed in the “safety precautions”.**
2. **Disconnect the yoke (DY) plug, degaussing coil (DEG) plug from the main board.**
3. **Unplug the CRT 2nd anode button from the main board.**
4. **Remove the C-Board from the CRT base and unplug the black wires (CRT dag ground) C10 & C11.**
5. **Disconnect the speakers plug from the A-Board.**
6. **Lift the main chassis (A-Board) and all mounted boards completely out with the CRT board attached.**
7. **Perform complete removal of chassis, as instructed in “disassembly for service” section.**

CRT replacement

1. **Perform “disassembly for CRT replacement” procedure.**
2. **Insure that the CRT H.V. Anode button is discharged before handling the CRT. Read the “safety precautions” section on handling the picture tube.**
3. **Remove the components from the CRT neck and place the cabinet face down on a soft pad.**
4. **Note the original order for the CRT mounting hardware as they are remove from the CRT mounting brackets at each corner of the CRT.**
5. **Remove the CRT with the degaussing coil and the dag ground braid attached.**
6. **Note the original locations and mounting of the degaussing coil and the dag ground assembly to insure proper reinstallation on the replacement CRT.**

To remove and remount the degaussing coil:

- **Unhook the coil spring from the bottom corners of the CRT ears.**
- **Release the braid loop from the upper corners of the CRT ears.**

7. **Mount the dag ground braid on the replacement CRT. Position the degaussing coil with new ties.**
   Dress coil as was on the original CRT.
8. **Replace the components on CRT neck and reinstall into cabinet.**
   Verify that all ground wires and circuit board plugs get connected.
   IMPORTANT NOTICE
   When ordering the CRT, please order CRT and CRT kit also.
   Please see parts list section for part numbers

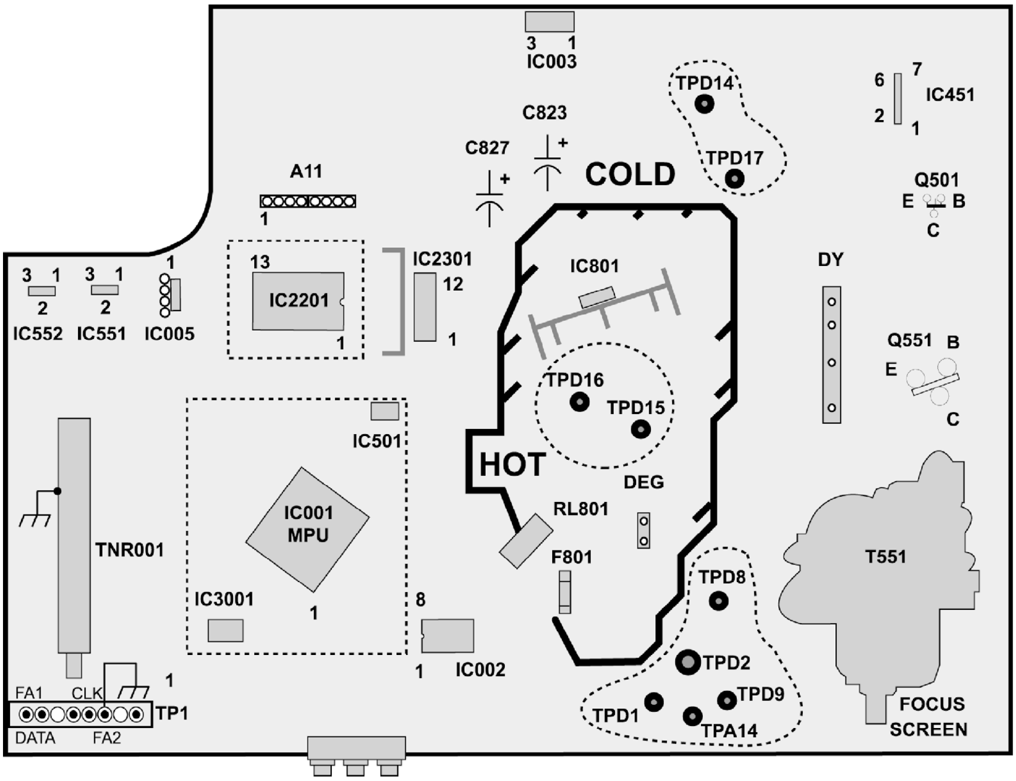
10. Chassis service adjustment procedures

All service adjustments are factory preset and should not require adjustment unless controls and/ or associated components are replaced.

Note:

Connect the (-) lead of the voltmeter to the appropriate ground. Use IC801's heat sink when the HOT ground symbol is used. Otherwise, use COLD ground (Tuner shield, IC451's heat sink or FA2).

Component and Voltage Test Points


3 1
IC003
TPD14
C823
C827
TPD17
COLD
A11
1
7
6
2
1
IC451
Q501
E B
C
DY
13
IC2201
1
IC2301
12
1
IC801
3 1
2
IC552
3 1
2
IC551
1
IC005
TPD16
TPD15
Q551 B
E
C
IC501
HOT
DEG
RL801
IC001
MPU
TNR001
F801
TPD8
T551
IC3001
1
8
1
IC002
TPD2
TPD9
TPD1
TPA14
FA1
CLK
1
TP1
DATA
FA2
FOCUS
SCREEN

Note:

Components and test points within doted areas are located on trace side.

B+ voltage check

1. **Set the BRIGHT and PICTURE to minimum by using the PICTURE menu.**
2. **Connect the DVM between C825 (+ side) or TPD14 and cold ground.**
3. **Confirm that B+ voltage is 131.0V ± 2.0V. This voltage supplies B+ to the horizontal output and flyback circuits.**

Source voltage chart

120V AC line input. Set the BRIGHT and the PICTURE to minimum by using the PICTURE menu. Use cold or hot ground for the (-) lead of the DVM as needed.

A-BOARD	TEST POINT	VOLTAGE 20”	VOLTAGE 25 “
+B2	TPD14	131.0 ± 2.0V	131.0 ± 2.0V
SOUND	C823 (+)	18.4 ± 1.0V	18.4 ± 1.0V
STB12V	C827 (+)	12.7 ± 1.0 V	12.7 ± 1.0 V
220V	TPA14	217 ± 10 V	221 ± 10 V
VERTICAL	TPD8	23.7 ± 1.5V	27.1 ± 1.5V
9V	IC551 pin 3	9.0 ± 0.5V	9.0 ± 0.5V
5V	IC552 pin 3	5.0 ± 0.5V	5.0 ± 0.5V
3.3V	IC005 pin 2	3.3 ± 0.3V	3.3 ± 0.3V
EHT	CRT anode	27.70 ± 1.25kV	29.25 ± 1.25kV
HEATER	JK351 H-HGND	6.3 ± 0.24V	6.3 ± 0.24V

High voltage check

1. Select an active TV channel and confirm that horizontal is in sync.
2. Adjust BRIGHTNESS and CONTRAST using PICTURE icon menu so video just disappears.
3. Using a high voltage meter confirm that the high voltage is 27.70 ± 1.25kV for 20” models and 29.25 ± 1.25kV for 25” models.

11. Purity and convergence procedure

Adjustment is necessary only if the CRT or the deflection yoke is replaced or if the setting was disturbed. The complete procedure consists of:

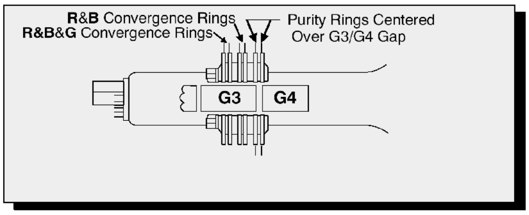
1. Vertical raster shift adjustment.
2. Initial static convergence.
3. Setting the purity.
4. Final static convergence.

WHEN THE CRT OR THE YOKE IS REPLACED

For 2 piece assembly:

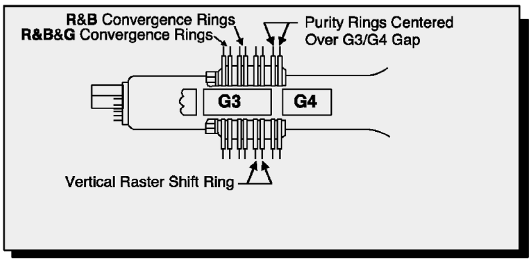
Position purity/convergence assembly as shown and tighten clamp snugly. Remove the hot-melt glue seal on assembly and position like tabs of purity device together at 12 o’ clock to reduce its magnetic field effect.

2 piece assembly

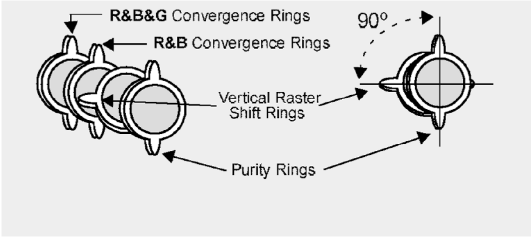

R&B Convergence Rings
R&B&G Convergence Rings
Purity Rings Centered Over G3/G4 Gap
G3
G4

For models using 4 pairs of rings, place the yoke on the CRT neck (do not tighten the clamp). Place the vertical raster shift tabs at 3 o'clock (90° from the purity and convergence tabs.

Description of rings


R&B Convergence Rings
R&B&G Convergence Rings
Purity Rings Centered Over G3/G4 Gap
G3
G4
Vertical Raster Shift Ring

Initial position of rings


R&B&G Convergence Rings
R&B Convergence Rings
90°
Vertical Raster Shift Rings
Purity Rings

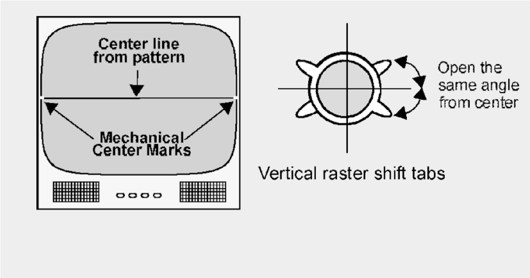
Turn the receiver ON. Operate the receiver for 60 minutes using the first purity check field (white screen) to stabilize the CRT.
Fully degauss the receiver by using an external degaussing coil.
Slide the deflection yoke back and forth on the neck of the CRT until it produces a near white, uniform raster.

VERTICAL RASTER SHIFT ADJUSTMENT

Apply a green pattern with a horizontal line, adjust the Deflection Yoke so that has no tilt, then secure it.
Adjust center line of the pattern with the mechanical center of the CRT, this center is determined by two marks at the side edges of the screen. To adjust the line, once the vertical raster shift tabs are place at 3 o'clock to reduce itsmagnetic field effect open the tabs the same angle from the center, until the center line of the pattern becomes a straight line, centered with the marks of the CRT.

IMPORTANT NOTICE
Rings come along with deflection yoke in one piece.

Vertical raster shift adjustment



INITIAL CENTER STATIC CONVERGENCE

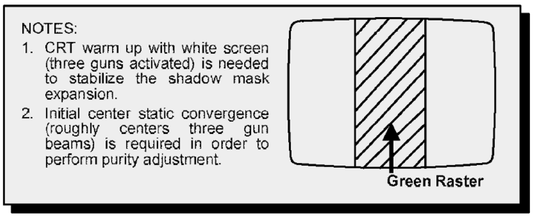
Connect a dot/cross hatch generator to the receiver and tune in a signal. Observe misconvergence at center of the screen only.
Adjust the R&B pole magnets; by separating tabs and rotating to converge blue with red.
Adjust the R&B and R&B&G pole magnets: by separating tabs and rotating to converge blue and red (magenta) with green.

NOTE
Precise convergence at this point is not important.

PURITY ADJUSTMENT

When the receiver is in the serviceman mode for making electronic adjustments, press the RECALL button on the remote control to enter purity check. (See the service adjustments electronic controls procedure).
Operate the receiver for 60 minutes using the first purity check field (white screen) to stabilize the CRT.
Fully degauss the receiver by using an external degaussing coil.
Press the RECALL button on the remote control again until the purity check (green screen) appears.
Loosen the deflection yoke clamp screw and move the deflection yoke back as close to the purity magnet as possible.
Adjust the purity rings to set the vertical green raster precisely at the center of the screen.

Green raster adjustment



NOTES:
1. CRT warm up with white screen (three guns activated) is needed to stabilize the shadow mask expansion.
2. Initial center static convergence (roughly centers three gun beams) is required in order to perform purity adjustment.

Slowly move the deflection yoke forward until the best overall green screen is displayed.
Tighten the deflection yoke clamp screw.
Press the RECALL button on the remote control again until the purity check blue and red screens appear and observe that good purity is obtained on each respective field.
Press the RECALL button on the remote control again until purity check (white screen) appears.
Observe the screen for uniform white. If purity has not been achieved, repeat the above

procedure.

FINAL CONVERGENCE PROCEDURE

NOTE

Vertical size and focus adjustments must be completed prior to performing the convergence adjustment. Connect a dot pattern generator to the receiver. The brightness level should not be higher than necessary to obtain a clear pattern.

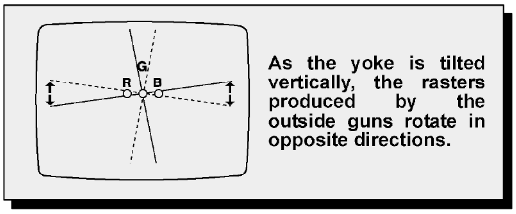
Converge the red and the blue dots at the center of the screen by rotating the R&B pole static convergence magnets.
Align the converged red/blue dots with the green dots at the center of the screen by rotating the R &B&G pole static convergence magnets. Melt wax with soldering iron to reseal the magnets.
Slightly tilt vertically and horizontally (do not rotate) the deflection yoke to obtain a good overall convergence.
If convergence is not reached at the edges, insert permalloy in the DY corners to achieve proper convergence. Recheck for purity and readjust if necessary.
After vertical adjustment of the yoke, insert wedge at 11 o’clock position, then make the horizontal tilt adjustment.
Secure the deflection yoke by inserting four side wedges.
Apply adhesive between tab (thin portion) of wedge and CRT and place tape over the tab to secure to the CRT.

11.1. Permalloy convergence corrector strip (Part No. 0FMK014ZZ)

This strip is used in some sets to match the yoke and CRT for optimum convergence. If the yoke or CRT is replaced, the strip may not be required.
First converge the set without the strip and observe the corners.
First converge the set without the strip and observe the corners.
If correction is needed:

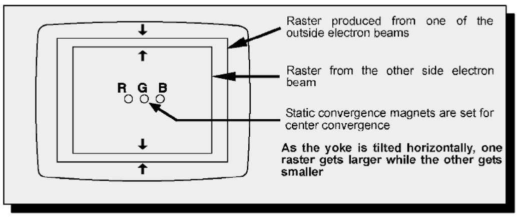
1. **Place strip between CRT and yoke, in quadrant needing correction. Slowly move it around for desired results.**
2. **Press adhesive tightly to the CRT and secure with tape.**

Vertical Yoke Movement



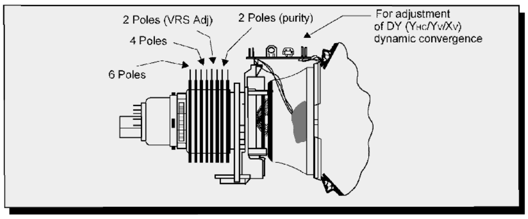
As the yoke is tilted vertically, the rasters produced by the outside guns rotate in opposite directions.

Horizontal Yoke Movement



R G B
Raster produced from one of the outside electron beams
Raster from the other side electron beam
Static convergence magnets are set for center convergence
As the yoke is tilted horizontally, one raster gets larger while the other gets smaller

Convergence Magnets and Wedges Location



2 Poles (VRS Adj)
2 Poles (purity)
For adjustment of DY (Y_{HC}/Y_V/X_V) dynamic convergence
4 Poles
6 Poles

12. Service mode (electronic adjustments)

This receiver has electronic technology using the IC bus concept. It performs as a control function and it replaces many mechanical controls. Instead of adjusting mechanical controls individually, many of the control functions are now performedby using “on screen display menu”. (The service adjustment mode).

NOTE

It is suggested that the technician reads all the way through and understand the following procedure for entering/exiting the service adjustment mode; then proceed with the instructions working with the receiver. When becoming familiarwith the procedure, the flow chart for service mode may be used as a quick guide.

Quick entry to service mode

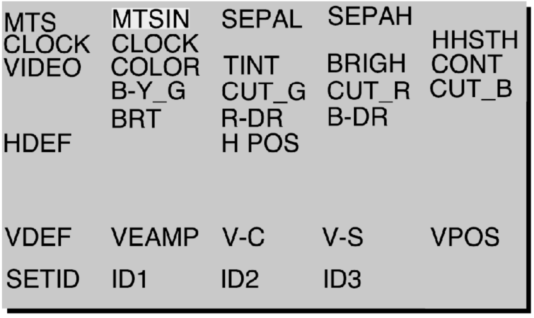
When minor adjustments need to be done to the electronic controls, the method of entering the service mode without removal of the cabinet back is as follows using the remote control:

1. **Select SET-UP icon and select CABLE mode.**
2. **Select TIMER icon and set SLEEP time for 30 Min.**
3. **Press “ACTION” twice to exit menus.**
4. **Tune to the channel 124.**
5. **Adjust VOLUME to minimum (0).**
6. **Press VOL → (decrease) on receiver. Red “CHK” appears in upper corner.**

To toggle between aging and service modes:

While the “CHK” is displayed on the left top corner of the CRT, pressing “ACTION” and “VOL” UP on the TV simultaneously will toggle between the modes. Red “CHK” for serviceand yellow “CHK” for aging.

7. Press POWER on the remote control to display the service adjustment modes menu, select adjustment by pressing the volume right/left buttons and channel up/down buttons on the remote and ACTION to enter the adjustment.



MTS	MTSIN	SEPAL	SEPAH	
CLOCK	CLOCK			HHSTH
VIDEO	COLOR	TINT	BRIGH	CONT
	B-Y_G	CUT_G	CUT_R	CUT_B
	BRT	R-DR	B-DR	
HDEF		H POS		
VDEF	VEAMP	V-C	V-S	VPOS
SETID	ID1	ID2	ID3	

Exiting the service mode:

This TV goes out from service mode when it is unplugged or turned OFF. To exit the service mode, turn the TV OFF from or unplug the TV from A.C.

Other method

Press ACTION and POWER on the receiver simultaneously for at least 2 seconds.
The receiver momentarily shuts off; then comes back on tuned to channel 3 with a preset level of sound.
Any programmed channels, channels caption data and some others user defined settings will be erased when exited by pressing ACTION and POWER on receiver.

IMPORTANT NOTE

Always check that the TV exits the service mode.

To confirm colors

When in service mode (red “CHK” is displayed) press RECALL on the remote control to enter the purity field check mode

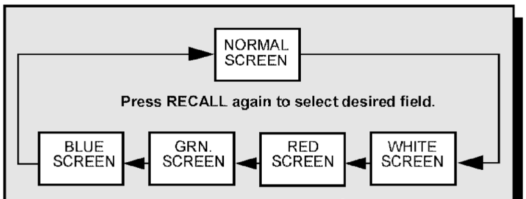


Figure 1. Purity check field mode.

Entering service mode (open-back method)

While the receiver is connected and operating in normal mode, momentarily short test point FA1 (TP1 pin 2) to cold ground (TP1 pin 3).

The receiver enters the aging mode.

Yellow letters “CHK” appear in the upper left corner of the screen. / (The volume right/left and channel up/down will adjust rapidly).

Note:

If service mode is accessed by this method be sure to reset the set after service is performed.

12.1. Service adjustment default values for items

NAME	DESCRIPTION	ADDRESS	REGISTER VALUE		
			CT-20G8G/ SG	CT-20L8G	CT-25L8 UG
MTSIN	MTS INPUT LEVEL	A4 01	25	25	25
SEPAL	MTS LOW LEVEL SEPARATION	A4 02	08	08	08
SEPAH	MTS HIGH LEVEL SEPARATION	A4 03	1D	1D	1D
CLOCK	CLOCK	A4 04	128	128	128
HHSTH	HHS VOLTAGE LEVEL REFERENCE	A4 05	9D	9D	89
COLOR	COLOR	A4 06	01 15	01 15	01 15
TINT	TINT	A4 08	56	56	56
BRIGH	SUB-BRIGHTNESS	A4 09	4E	4E	40
CONT	SUB-CONTRAST	A4 0A	38	38	60
B-Y_G	MAGENTA TINT ADJ	A4 0B	80	80	80
CUT_G	GREEN CUT-OFF	A4 0C	01 C3	01 C3	02 05
CUT_R	RED CUT-OFF	A4 0E	02 0E	02 0E	02 9B
CUT_B	BLUE CUT-OFF	A4 10	01 5B	01 5B	01 F4
BRT	BRIGHT	A4 12	4E	4E	40
R-DR	RED DRIVE	A4 13	09 00	09 00	08 86
B-DR	BLUE DRIVE	A4 15	09 00	09 00	07 ED
H-POS	HORIZONTAL POSITION	A4 18	82	82	73
VEAMP	VERTICAL SIZE	A4 29	9B	9B	9C
V-C	VERTICAL LINEARITY	A4 2A	4C	4C	4C
V-S	VERTICAL SIZE CORRECTION	A4 2B	00	00	00
VPOS	VERTICAL POSITION	A4 FF	7C	7C	77
ID1*	ID SWITCH 1	A4 E9	88	70	70
ID2*	ID SWITCH 2	A4 EA	06	06	06
ID3*	ID SWITCH 3	A4 EB	30	30	30

IMPORTANT:

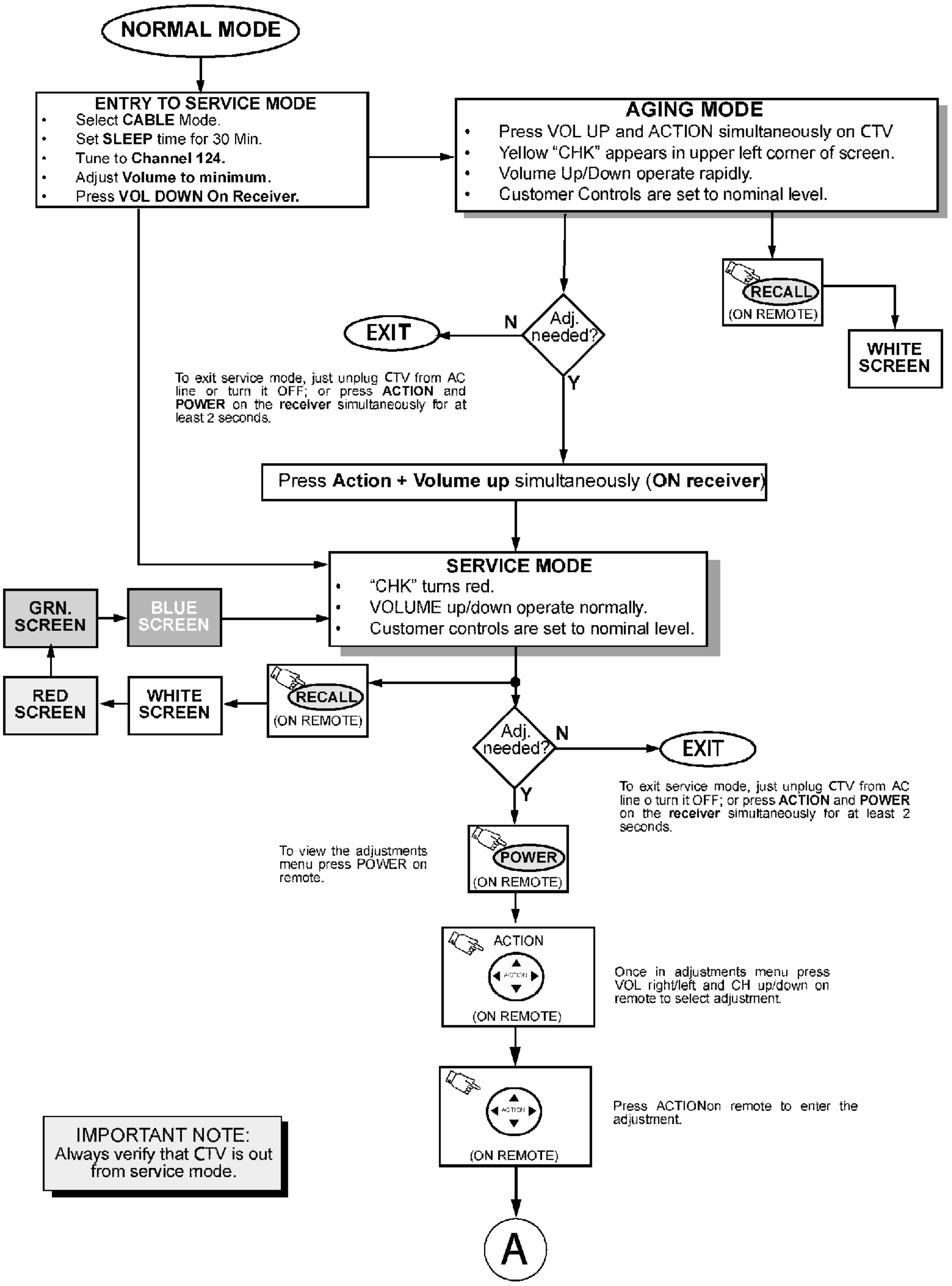
These table values are approximated and could change due to

variation of electrical characteristics in each set, except for the ID switch values.

***Note:**

The correspondent ID switch (ID1,ID2, ID3) data configuration should not be modified in any way. If EEPROM circuit needs to be replaced, these ID values should be configured according with this table.

12.2. Instructional Flow Chart for Service Mode


NORMAL MODE
ENTRY TO SERVICE MODE
Select CABLE Mode.
Set SLEEP time for 30 Min.
Tune to Channel 124.
Adjust Volume to minimum.
Press VOL DOWN On Receiver.
AGING MODE
Press VOL UP and ACTION simultaneously on CTV
Yellow "CHK" appears in upper left corner of screen.
Volume Up/Down operate rapidly.
Customer Controls are set to nominal level.
RECALL
(ON REMOTE)
WHITE SCREEN
EXIT
N
Adj. needed?
Y
Press Action + Volume up simultaneously (ON receiver)
SERVICE MODE
"CHK" turns red.
VOLUME up/down operate normally.
Customer controls are set to nominal level.
GRN. SCREEN
BLUE SCREEN
RED SCREEN
WHITE SCREEN
RECALL
(ON REMOTE)
Adj. needed?
N
EXIT
Y
POWER
(ON REMOTE)
ACTION
(ON REMOTE)
(ON REMOTE)
A
IMPORTANT NOTE:
Always verify that CTV is out from service mode.

To exit service mode, just unplug CTV from AC line or turn it OFF; or press **ACTION** and **POWER** on the **receiver** simultaneously for at least 2 seconds.

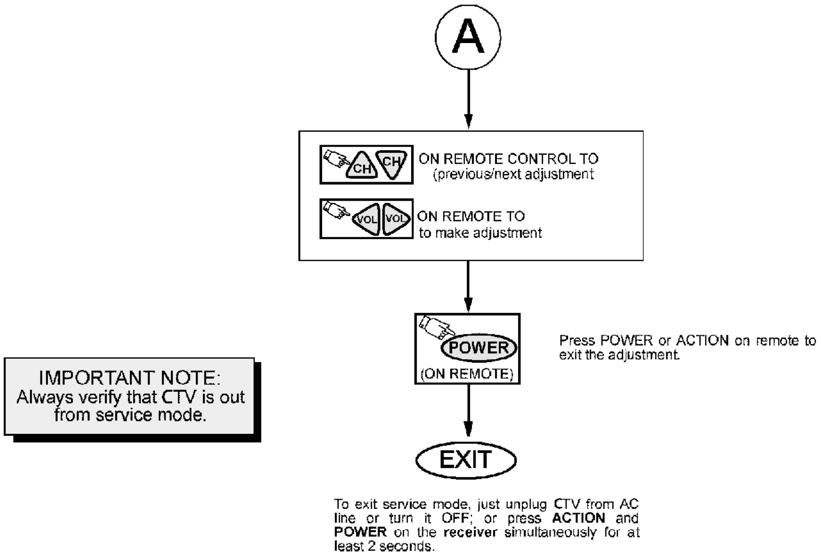
To exit service mode, just unplug CTV from AC line o turn it OFF; or press **ACTION** and **POWER** on the **receiver** simultaneously for at least 2 seconds.

To view the adjustments menu press POWER on remote.

Once in adjustments menu press VOL right/left and CH up/down on remote to select adjustment.

Press ACTIONon remote to enter the adjustment.

12.3. Instructional flow chart for service mode (continued).


A
CH CH ON REMOTE CONTROL TO
(previous/next adjustment
VOL VOL ON REMOTE TO
to make adjustment
POWER
(ON REMOTE)
Press POWER or ACTION on remote to exit the adjustment.
IMPORTANT NOTE:
Always verify that CTV is out from service mode.
EXIT
To exit service mode, just unplug CTV from AC line or turn it OFF; or press ACTION and POWER on the receiver simultaneously for at least 2 seconds.

13. Service adjustments (electronic controls)

NOTE

Please correlate with available pattern on all adjustments

13.1. Sub-Brightness and Contrast / Service DAC adjustment (BRIGH, CONT)

Adjustment of this control is important for setting proper operation of customer brightness and picture controls. Do not adjust the SCREEN VR after the sub-brightness is set.
This adjustment is factory set. Do not adjust unless repairs are made to associated circuit, the CRT Board or when the CRT is replaced.

Preparation

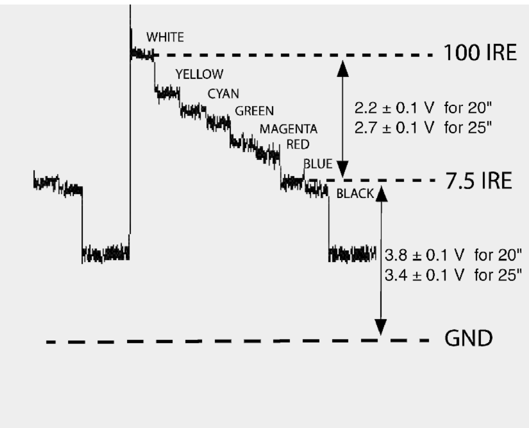
1. **Apply a colorbar pattern.**
2. **Set the PICTURE control to the maximum.**
3. **Set COLOR control to minimum (no color on picture).**
4. **Set the BRIGHTNESS control to the center.**
5. **Set the SHARPNESS control to the center.**
6. **Connect the oscilloscope to TP35.**

Procedure

1. **In the service mode, select DAC for brightness adjustment**

"BRIGH", and adjust data to obtain 3.8±0.1V (for 20" CRT) or 3.4± 0.1V (for 25" CRT) between 7.5IRE and GND level at TP35. (See waveformdetail).

2. **In service mode, select DAC for contrast adjustment "CONT", and adjust data to obtain 2.2±0.1V (for 20" CRT) or 2.7±0.1V (for 25" CRT) between 7.5IRE and 100IRE level at TP35. (See waveform detail)**



13.2. Color output adjustment / Service DAC adjustment (COLOR, TINT)

NOTE

if a rainbow pattern generator is available perform the following procedure; the next section describes the procedure with no rainbow pattern.

Make sure that sub-contrast adjustment was finished prior to perform this adjustment.

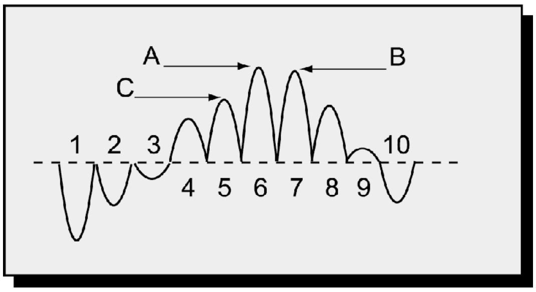
PREPARATION

1. **Normalize the picture settings.**
2. **Set the BRIGHTNESS control to minimum.**
3. **Set the COLOR control to the center.**
4. **Set the TINT control to the center.**
5. **Set the PICTURE control to the maximum.**
6. **Set the SHARPNESS control to the minimum.**

PROCEDURE

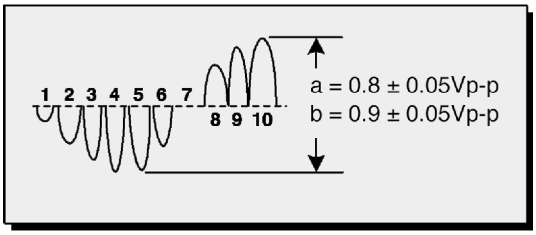
1. Apply a rainbow color bar pattern.
2. Connect the oscilloscope to TP37.
3. In service mode adjust “TINT” register until the waveform measured is as the one shown. Tint level from A and B peaks must be almost in the same level (0.3 Vp for 20” models and 0.35 Vp for 25” models).

TP37 Waveform.



4. Connect the oscilloscope to TP35 and GND.
5. Adjust “COLOR” register so that the amplitude “a” is 0.8±0.05Vp-p for 20” models and amplitude “b” 0.9±0.05Vp-p for 25” models.

TP35 Waveform.



13.3. Color output adjustment / Service DAC adjustment / (COLOR, TINT, B-Y_G)

NOTE

Color and tint adjustment sets the reference settings for the user controls; It is important to read the procedures.

(NO RAINBOW PATTERN)

Make sure that sub-contrast adjustment was finished prior to perform this adjustment

PREPARATION

Normalize the picture settings.

PROCEDURE

1. Apply a color bar pattern.
2. In service mode adjust “R DR” and “B DR” data to “80”.
3. In service mode adjust “TINT” data so that the color does not become greenish or redish.
4. In service mode adjust “COLOR” data so that the color level is not too high (saturated) or too low (tending to black and white).
5. In service mode adjust “B-Y G” data so that blue and green seem natural.
6. Confirm that saturation and picture are normal (normal image).
7. If image is not satisfactory, repeat adjustment until the image is normal and natural.

NOTE

The image can be compared against other set to see the image quality.

13.4. Color temperature adjustment / (B/W Tracking) / Service DAC Adjust. / (CUT R) (CUT G) (CUT B) (R DR) (B DR)

Minor Touch-Up Method

OBSERVE low and high brightness areas of a B/W picture for proper tracking. Adjust only as required for “good gray scale and warm highlights”.

1. LOW LIGHT areas - In service mode for making electronic adjustments, select CUT R, CUT G, CUT B and adjust the picture for gray.
2. HIGH LIGHT areas - In service mode for making electronic adjustments, select drive R DR, B DR and adjust the picture for warm whites.

Complete adjustment

PREPARATION

1. Turn the receiver “ON” and allow 30 minutes warm up at WHITE

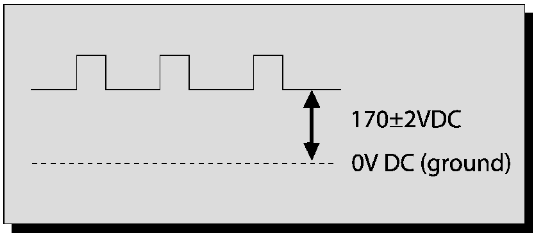
PATTERN.

2. Apply a color bar pattern (with no color).
3. Turn the SCREEN control (part of FBT T551) fully counterclockwise.
4. Preset the following service DACs for best results:

   - BRIGH_____________________1 D0
   - CUT R_____________________02 00
   - CUT G_____________________02 00
   - CUT B_____________________02 00
   - R DR______________________07 FF
   - B DR______________________07 FF

PROCEDURE

1. Connect the oscilloscope to KG (CRT-Board).
2. In service mode for making electronic adjustment, select “BRIGH” DAC.
3. Press RECALL button on the remote control to collapse the raster. (service SW).
4. Connect oscilloscope to KG on C-Board and adjust service mode “CUT-G” DAC until 170±2V above DC ground is measured
5. Remove the probe from KG.
6. Turn screen clockwise slowly until color is slightly appeared.
7. Then adjust “CUT R” and “CUT B” until line becomes white.
8. Press RECALL button on the remote to restore the raster.
9. Adjust “R DR” and “B DR” so the white seems like white and black like black.
10. Apply a normal signal and confirm that the image is normal and a good gray scale
11. If correction is needed perform minor touch-up method.



13.5. Deflection adjustments

To reset deflection adjustments

To reset deflection adjustments to factory adjusted default, enter to service mode (with red CHK displayed), press POWER button on remote to display the service menu, then press and hold RECALL button for at least three seconds, a reset messagewill appear in the image.
Use this feature when deflection adjustment gets off adjustment to the point that it cannot be adjusted back easily.

13.5.1. H-Center adjustment

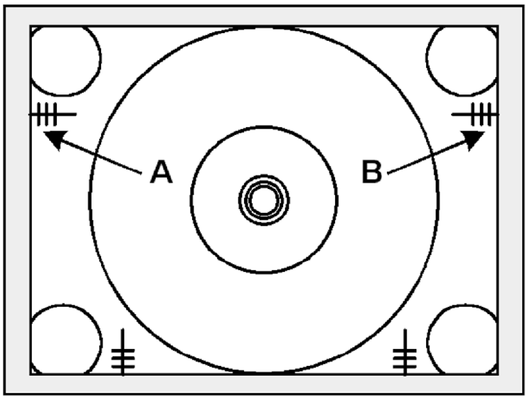
PREPARATION

1. **Apply a crosshatch pattern.**
2. **Normalize the picture settings.**

PROCEDURE

1. **Apply a monoscope pattern to center the picture.**

Horizontal Center Adjustment



2. **If the horizontal center is not aligned, in service mode adjust “H POS” DATA to adjust the horizontal center of the monoscope pattern to the CRT center.**

3. Verify that horizontal width (A & B mark) is within 4.5 ± 0.7 for 20” models and 5.0 ± 0.7 for 25” models.

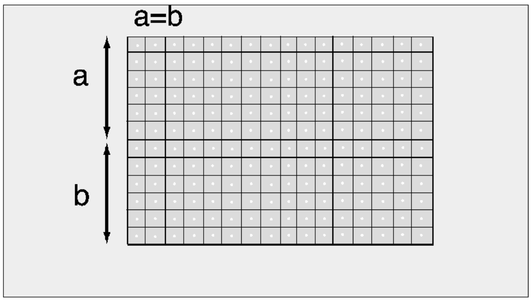
13.5.2. Vertical linearity(V-C), V-Size and V-Position adjustment

PREPARATION

1. Apply a crosshatch pattern
2. Normalize the picture settings.

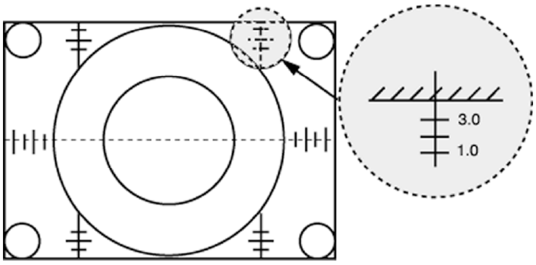
PROCEDURE

1. Enter service mode, select DAC adjustment / “V-POS” and adjust monoscope pattern to the center vertical position of the CRT center mark.
2. Adjust linearity data “V-C” so that interval of “a” is same as “b” (a= b).



3. If the v-position is not at the CRT center, adjust / V position “V POS” DATA again.
4. Apply a monoscope pattern.
5. Confirm that center horizontal line is in center mark on CRT.
6. Adjust “VEAMP” register for correct vertical size by making monoscope round circle leaving 4 marks off the CRT edge.

Vertical centering adjustment.



13.5.3. V-S Correction adjustment

PREPARATION

1. Apply a crosshatch pattern
2. Normalize the picture settings.

PROCEDURE

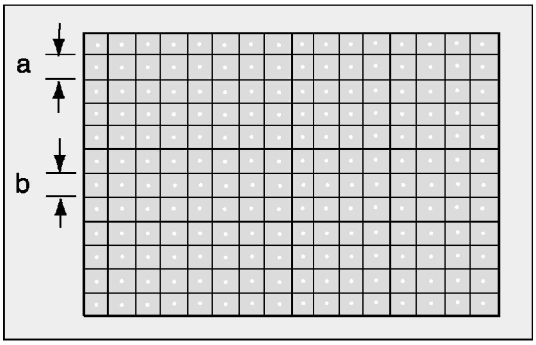
1. Enter to service mode
2. Check a and b sizes, If b-a < -1.5mm (in top & bottom extending case)

    - Increase "V-S" DATA by one step

NOTE
Repeat "a" and "b" until b-a ± 1.5mm

3. Confirm to make outermost circle of monoscope pattern a correct circle

V-Adjustment



13.6. MTS circuit adjustments

The MTS circuit adjustments require two steps:

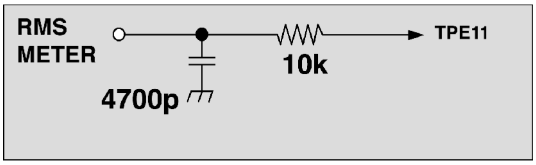
1. Input level adjustment.
2. Stereo separation adjustment.

Input level adjustment / Service DAC adjustment (MTSIN)

PREPARATION

1. Connect an RMS meter with filter jig as shown in figure to TPE11.

Filter Jig



2. Connect an RF signal generator to the RF antenna input.

PROCEDURE

1. Apply the following signal from the RF signal generator:

- **Video: 100 IRE flat field, 30% modulation.**
- **Audio: 300Hz, 100% modulation, monaural (70 ±5dB, 75 Ω OPEN, P/S 10dB). Make sure that the 75 μ s pre-emphasis is OFF.**

2. Adjust the MTS input level adjustment “MTSIN” data until the RMS voltage measured is 106 ± 6.0mVrms.

Stereo separation adjustment (SEPAH)

PREPARATION

1. Connect an R.F. signal generator to the RF antenna input.

2. Connect a scope to TPA20.

PROCEDURE

1. Select stereo mode in audio menu

2. Apply the following signal from the RF signal generator:

- **Video: 100 IRE flat field, 30% modulation.**
- **Audio: 300Hz, 30% modulation, stereo (left only) (70±5dB, 75 Ω**

OPEN, P/S 10dB).

NOTE
After setting 30% modulation with P.L. SW and N.R. SW OFF, turn P.L. SW and N.R. SW ON.

3. **In service mode, adjust the MTS Low-Level separation adjustment "SEPAL" data until the amplitude displayed on the scope is minimum.**
4. **Apply the following signal from the RF signal generator:**
   - **Video: 100 IRE flat field, 30% modulation**
   - **Audio: 3KHz, 30% modulation, stereo (left only) (70 ±5dB, 75 Ω OPEN, P/S 10dB).**

NOTE
After setting 30% modulation with P.L. SW and N.R. SW OFF, turn P.L. SW and N.R. SW ON.

5. **Adjust the MTS High-level separation adjustment "SEPAH" until the amplitude displayed on the scope is minimum.**
6. **Repeat above steps 2 through 5 until the amplitude is at minimum for both signals.**

13.7. Clock adjustment (CLOCK)

PREPARATION
Connect the frequency counter from TP017 / (IC001 pin 79) to cold ground

PROCEDURE

1. **Turn the receiver "OFF" with the A.C. power applied.**
2. **Measure TP017 (IC001 pin 79) for the frequency of the waveform and record the reading.**

NOTE

3. **TP017 (IC001 pin 79) measurement must have at least four digits**

of resolution following the decimal point. Example: 000.0000

4. Place the receiver into service mode for making electronic adjustment, select the clock adjustment DAC “CLOCK”.
5. Calculate and set “CLOCK” based on the following formula:

$$\text{CLOCK} = 128 - \left[\frac{(\text{TP017}_{freq} - 610.35)}{610.35} \times 450000\right]$$

NOTE

TP017 (IC001 pin 79) measurement will not change regardless of the value stored in CLOCK.

13.8. Service Adjustments Mechanical Controls

WIDTH CORRECTION ADJUSTMENT

Note

Perform this adjustment only when FBT is changed.

FOCUS (PART OF T551)

Preparation

Apply a crosshatch pattern with dots.

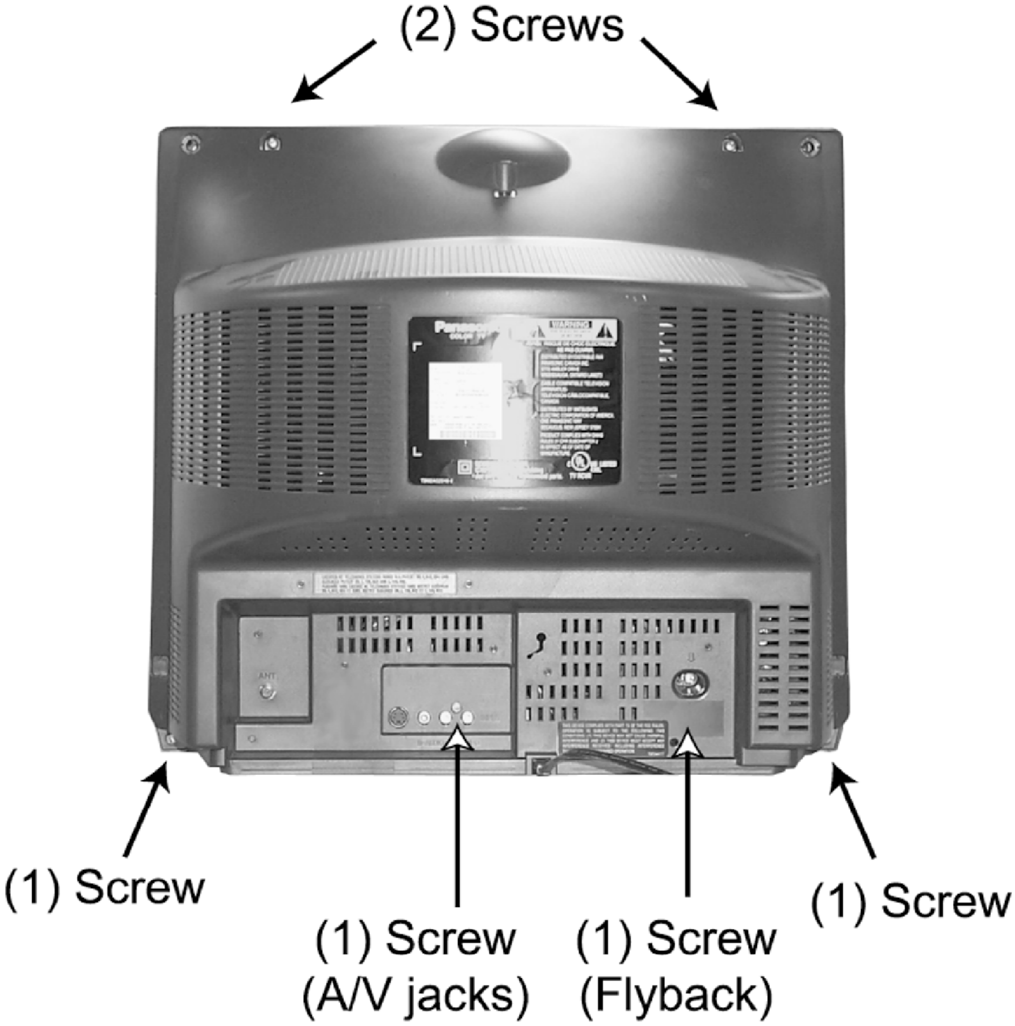
Procedure

1. Adjust the FOCUS VR to obtain the sharpest and clearest dot pattern.
    - Adjust for best center.
    - Adjust for best area between the center and top right corner.

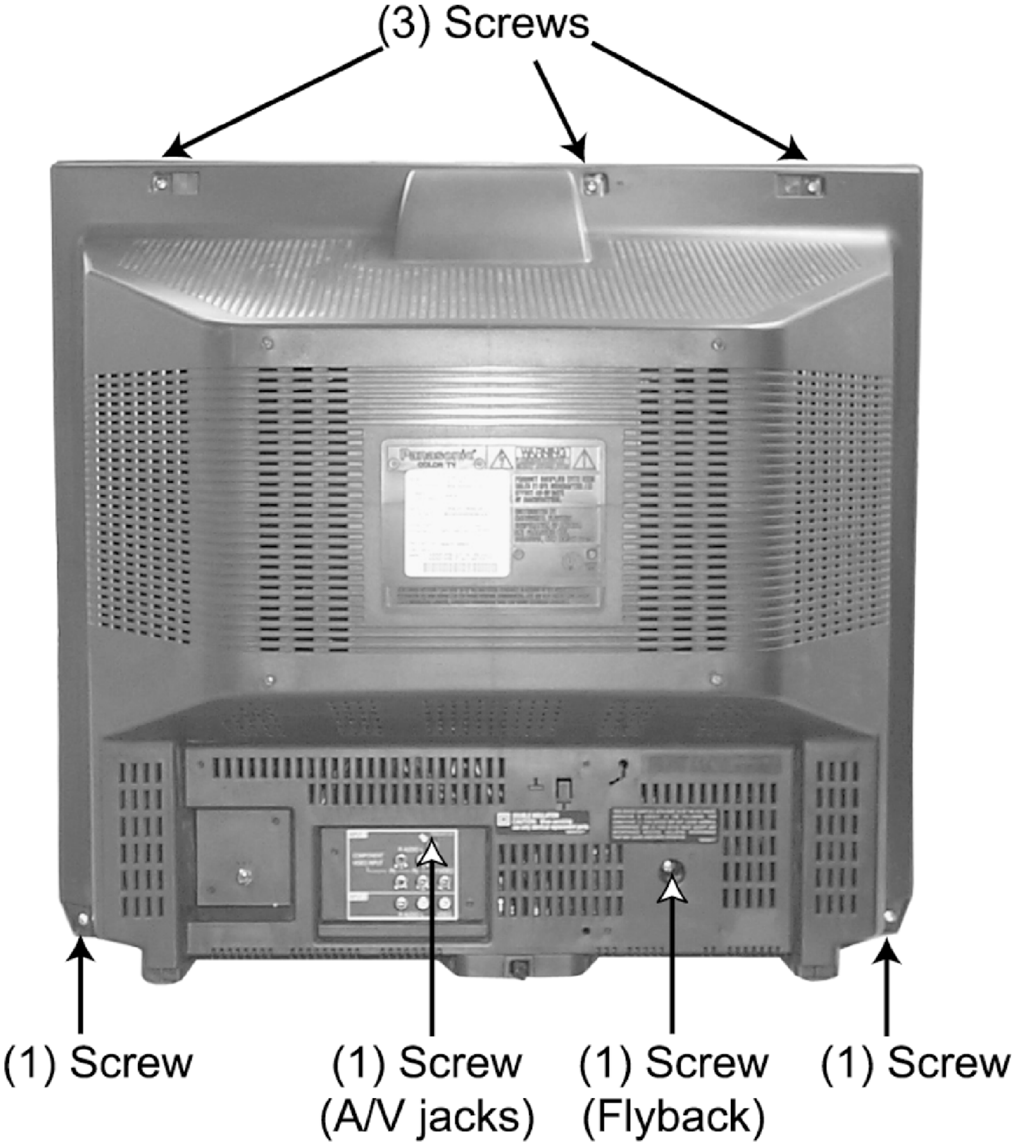
14. Identification of Components

14.1. Back Cover Removal

Back Cover Removal (CT-20G8G/CT-20G8SG/CT-20L8G).


(2) Screws
(1) Screw
(1) Screw
(A/V jacks)
(1) Screw
(Flyback)
(1) Screw

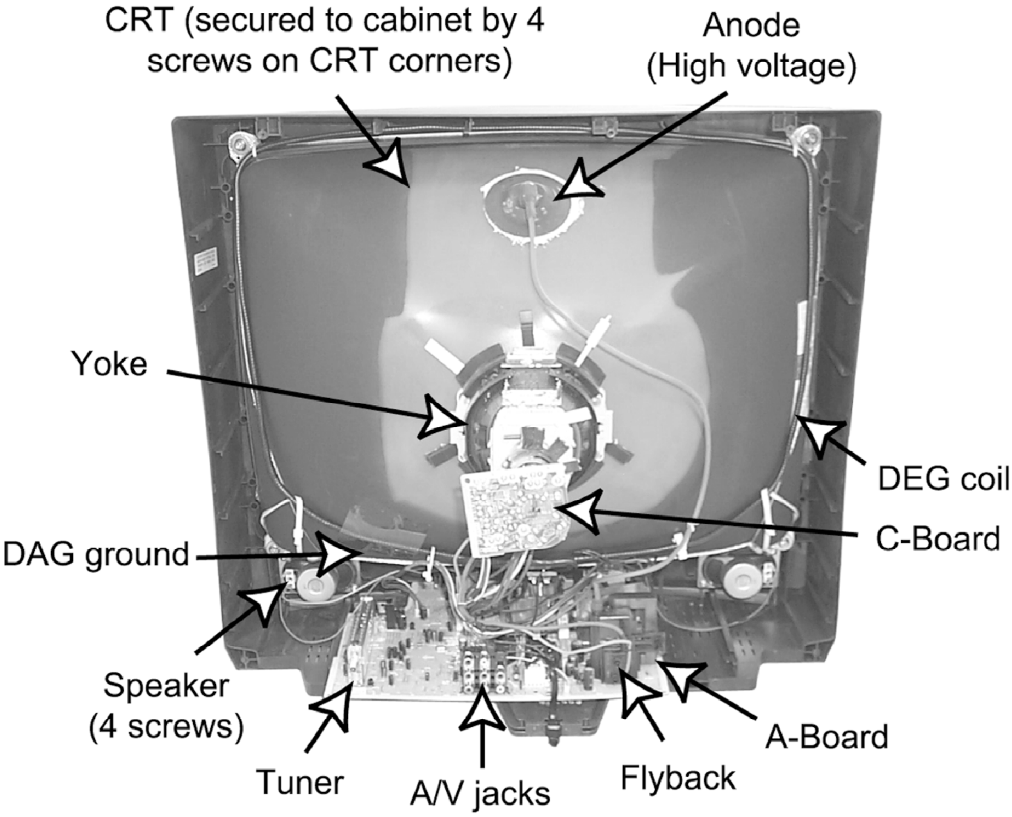
Back Cover Removal (CT-25L8G/CT-25L8UG).



(3) Screws
(1) Screw
(1) Screw
(A/V jacks)
(1) Screw
(Flyback)
(1) Screw

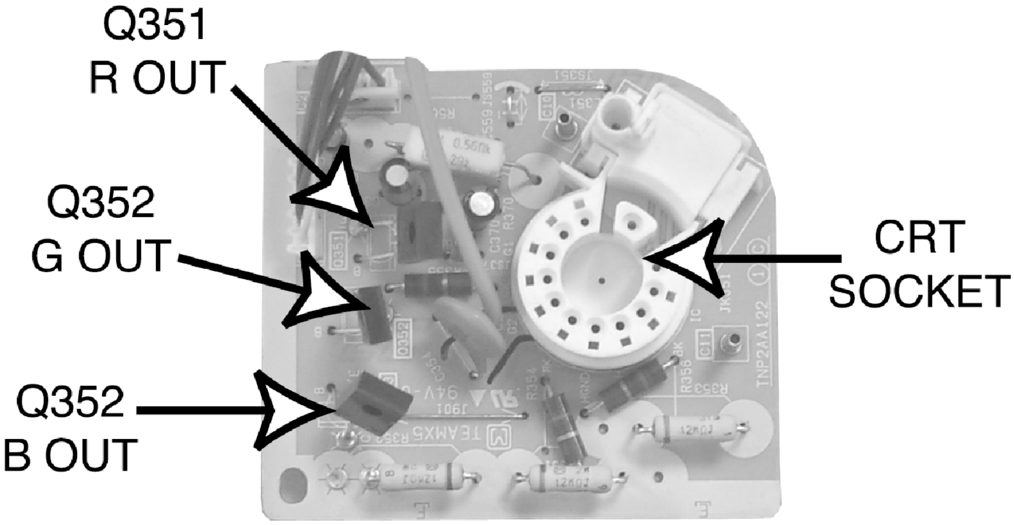
14.2. Chassis Components

Rear view (inside cabinet).


CRT (secured to cabinet by 4 screws on CRT corners)
Anode (High voltage)
Yoke
DEG coil
C-Board
DAG ground
Speaker (4 screws)
Tuner
A/V jacks
Flyback
A-Board

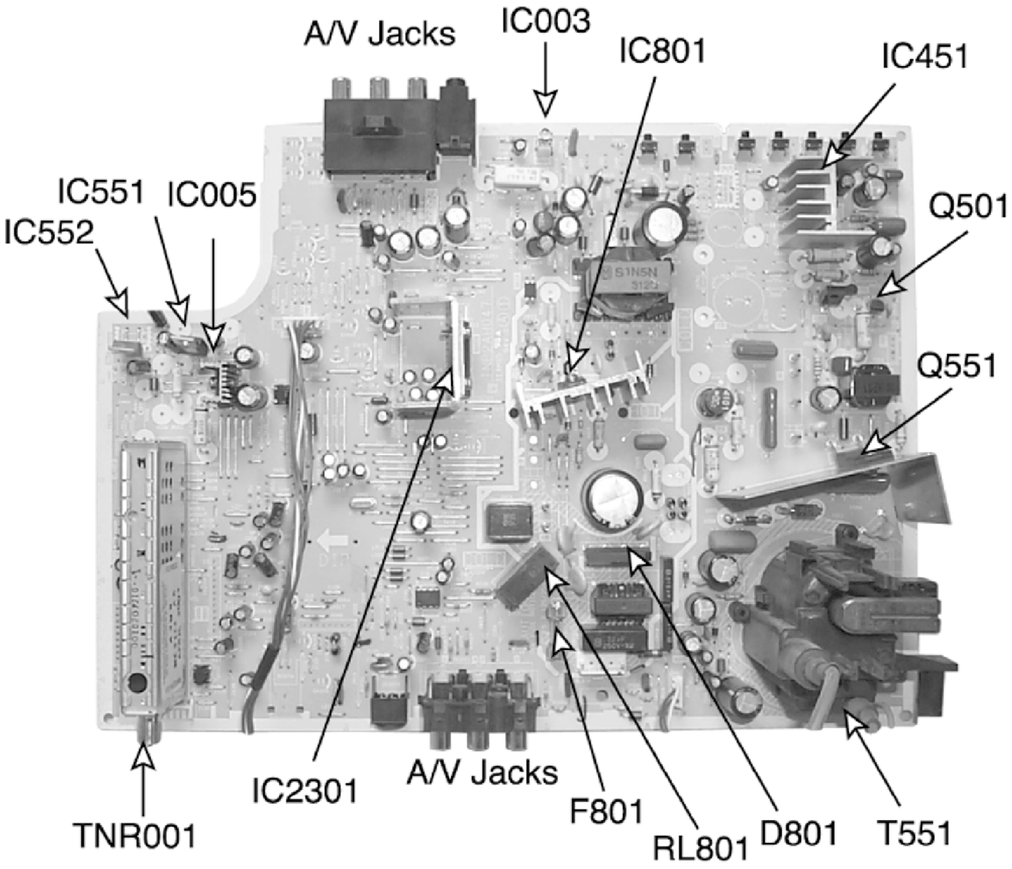
14.2.1. C-Board Chassis

C-Board component locations


Q351 R OUT
Q352 G OUT
Q352 B OUT
CRT SOCKET

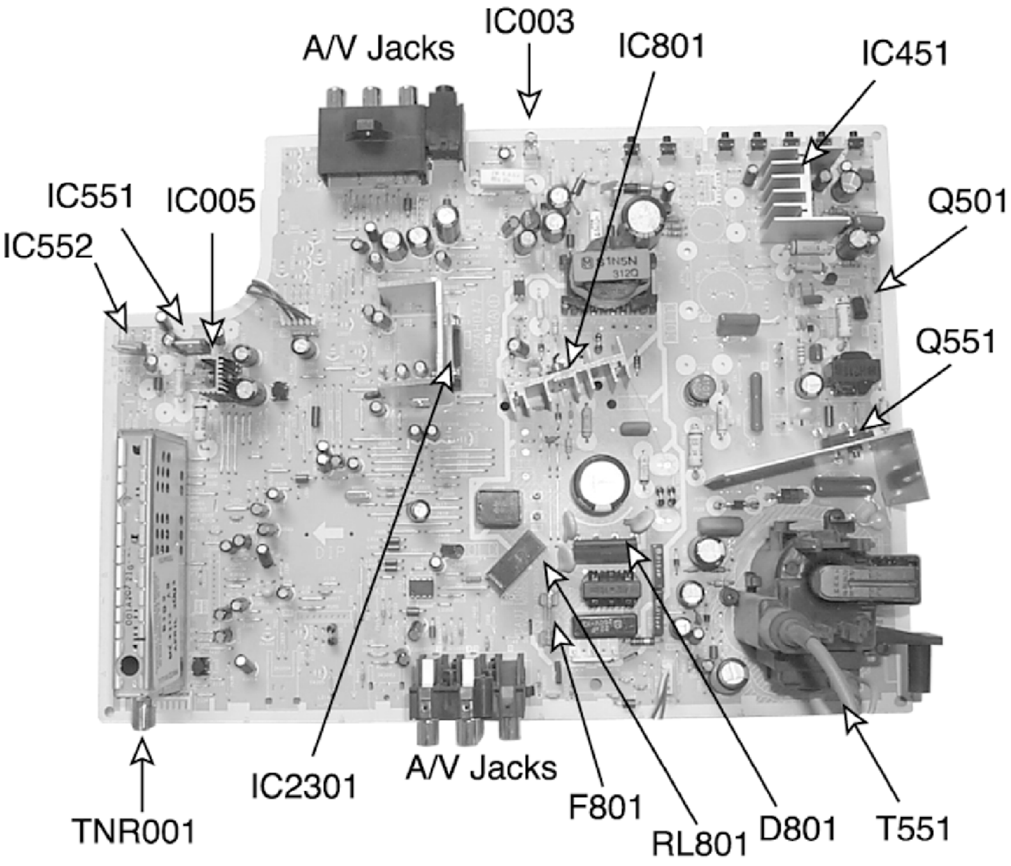
14.2.2. CT-20G8G/CT-20G8SG A-Board Chassis

A-Board Top view (CT-20G8G/CT-20G8SG).


A/V Jacks
IC003
IC801
IC451
IC551
IC005
IC552
Q501
Q551
TNR001
IC2301
A/V Jacks
F801
RL801
D801
T551

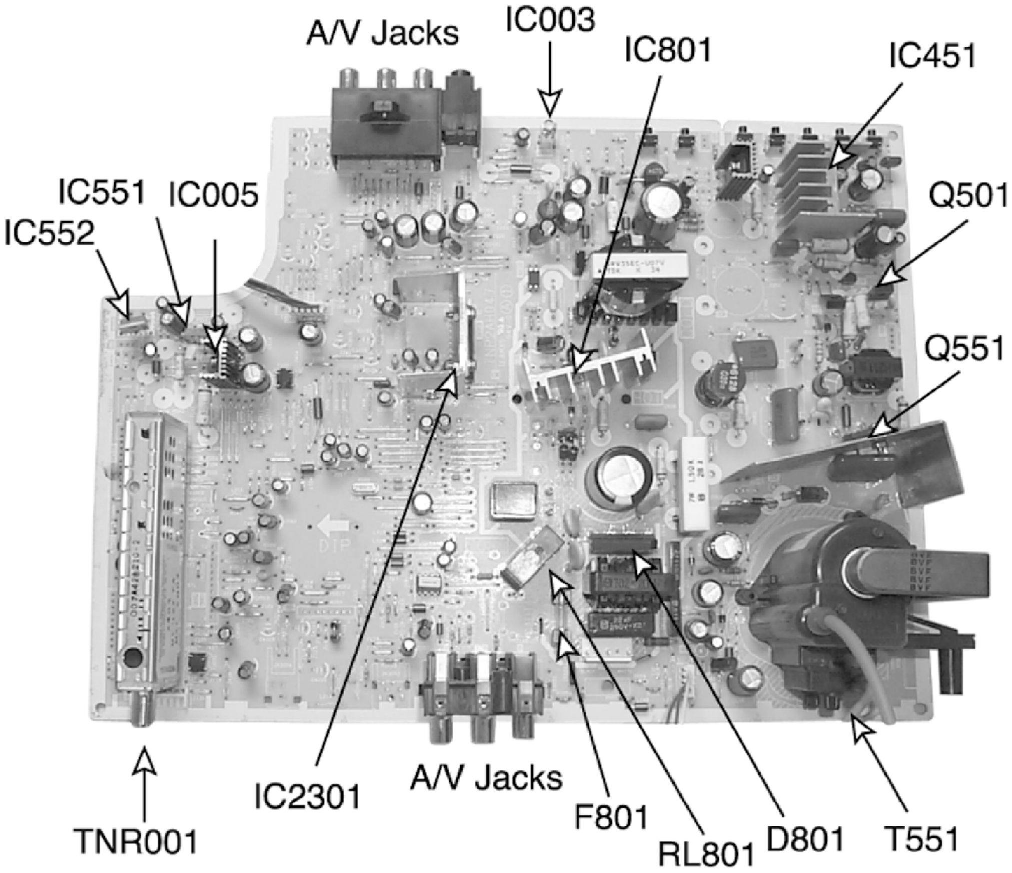
14.2.3. CT-20L8 A-Board Chassis

A-Board Top view (CT-20L8G)


A/V Jacks
IC003
IC801
IC451
IC551
IC005
IC552
Q501
Q551
TNR001
IC2301
A/V Jacks
F801
RL801
D801
T551

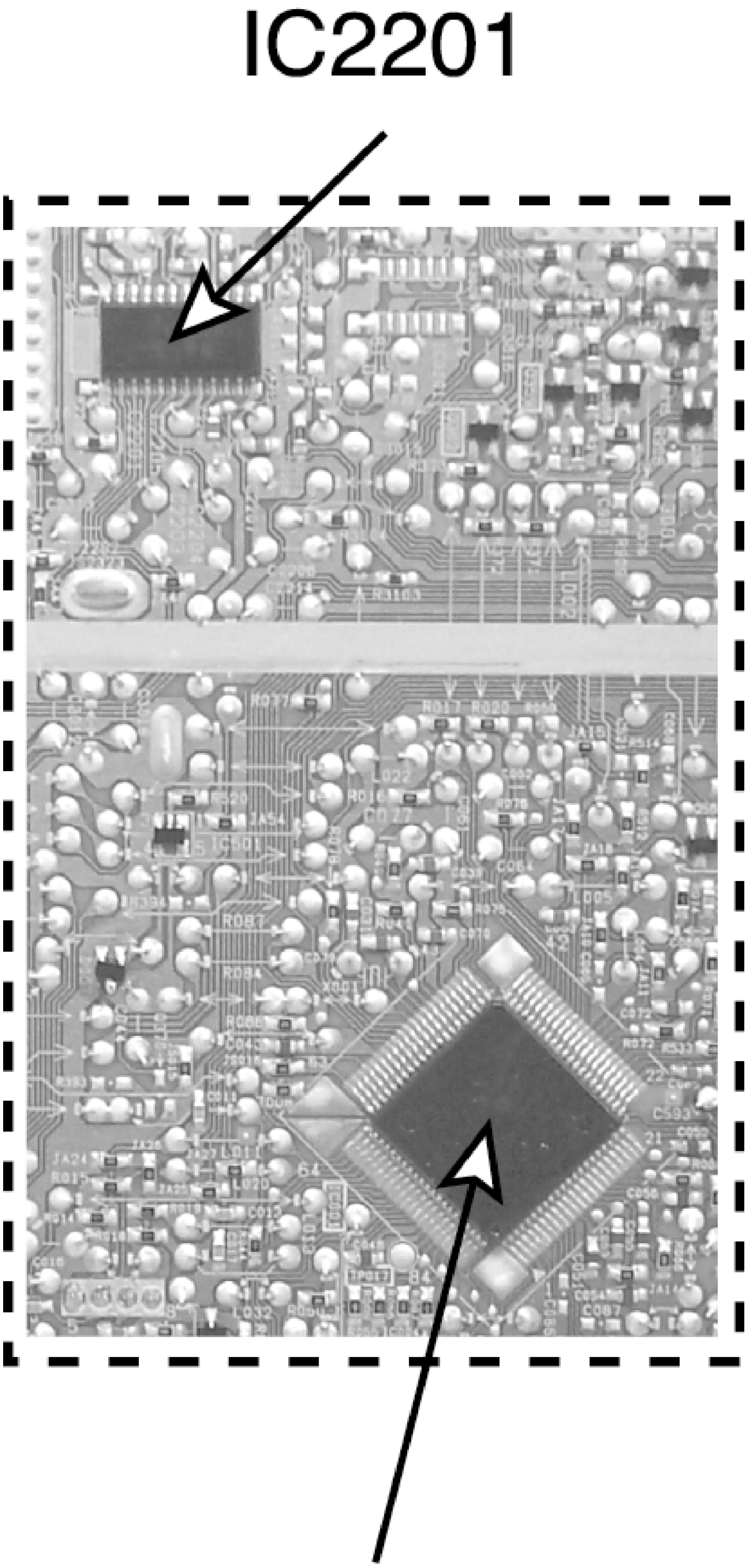
14.2.4. CT-25L8/CT-25L8U A-Board Chassis

A-Board Top view (CT-25L8G/CT-25L8UG).


A/V Jacks
IC003
IC801
IC451
IC551
IC005
IC552
Q501
Q551
TNR001
IC2301
A/V Jacks
F801
RL801
D801
T551

14.2.5. A-Board Surface-mounted components

A-Board (bottom view)


IC2201

IC001

15. Reference for PDF Colors

DESCRIPTION OF PDF LINK COLORS	
TYPE	DESTINATION
SCHEMATIC	
YELLOW ON IC	IC ON PCB
YELLOW ON CONNECTOR	CONNECTOR ON PCB
YELLOW ON SCHEMATIC	PCB
CYAN	WAVEFORM
GREEN ON SIDE	SCHEMATIC CONTINUED
GREEN ON CONNECTOR	CONNECTOR CONNECTION
BLUE ON IC	VOLTAGE
PCB	
BLUE ON IC	IC ON SCHEMATIC
BLUE ON CONNECTOR	CONNECTOR ON SCHEMATIC
BLUE ON PCB	SCHEMATIC
GREEN ON SIDE	PCB CONTINUED
BLOCK DIAGRAMS	
GREEN ON IC	IC ON SCHEMATIC
GREEN ON SIDE	BLOCK DIAGRAM CONTINUED

16. Conductor Views

16.1. A-Board Printed Circuit (Left Side)

16.2. A-Board& C Board Printed Circuit (Right Side)

17. Block Diagrams

17.1. Video Signal Block Diagram

17.2. Audio Signal Block Diagram

18. Schematics

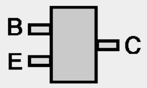
18.1. English Schematic Notes

Notes:

IMPORTANT SAFETY NOTICE

THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES THAT ARE IMPORTANT FOR PROTECTION FROM X-RADIATION, FIRE AND ELECTRICAL SHOCK HAZARDS. WHEN SERVICING IT IS ESSENTIAL THAT ONLY MANUFACTURERS SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS DESIGNATED WITH A ⚠ IN THE SCHEMATIC.

CHIP TRANSISTOR LEAD DESIGNATION



SCHEMATIC NOTES

1. Resistors are carbon 1/4W unless noted otherwise.
2. Capacitors are ceramic 50V unless noted otherwise.
3. Coil value notes is inductance in µH.
4. Test point indicated by ● ; Test point but no pin ○.
5. Components indicated with ⚠ are critical parts and replacement should be made with manufacture specified replacement parts only.
6. ▬ (**BOLD LINE**) indicates the route of B+ supply.
7. The schematic diagrams are current at the time of printing and are subject to change without notice.
8. Ground symbol ⏚ indicates **HOT GROUND CONNECTION**; ⊥ indicates COLD GROUND.

NOTE: All other component symbols are used for engineering design purposes.

VOLTAGE MEASUREMENTS

1. Voltage measurement:
   - AC input to the Receiver is 120V. NTSC (HD, 1125i & 525P when applicable) signal generator is connected to the antenna of the Receiver. (Color bar pattern of 100 IRE white and 7.5 IRE black.)
   - All Picture and Audio adjustments are set to Normalize.
     TV ANT/CABLE - (Set-Up Menu) in TV/ANT Mode
     Volume - Min.
     TV/Video SW - TV position
     Audio Mode - Stereo
   - Voltage readings are nominal and may vary ±10% on active devices. Some voltage reading will vary with signal strength and picture content.
   - Supply voltages are nominal.
2. Ground symbol ⏚ indicates ground lead connection of meter.
   Incorrect ground connection will result in erroneous readings.

CAUTION: ***Incorrect ground connection of the test equipment will result in erroneous readings.***

WAVEFORM MEASUREMENTS

1. ③ indicates waveform measurement. (Measurement can be taken at the best accessible location in common to the indicated point.)
2. Taken with an NTSC signal generator connected to the antenna terminal. (NTSC color bar pattern of 8 bars of EIA colors, 100 IRE white and 7.5 IRE black.)
3. Customer Controls (Picture/Audio Menu) are set to Normalize. Volume is set to “MIN”.
4. All video and color waveforms are taken with a wideband scope and a probe with low capacitance (10 to 1). Shape and peak altitudes may vary depending on the type of Oscilloscope used and its settings.
5. Ground symbol ⏚ shown on waveform number indicates (Hot) ground lead connection of the Oscilloscope.

CAUTION: Incorrect ground connection of the test equipment will result in erroneous readings.

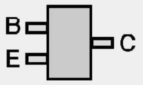
18.2. Notas de Esquemáticos en Español

Notas

NOTA DE SEGURIDAD

LOS DIAGRAMAS ELÉCTRICOS INCLUYEN CARACTERÍSTICAS ESPECIALES MUY IMPORTANTES PARA LA PROTECCIÓN CONTRA RAYOS-X, QUEMADURAS Y DESCARGAS ELÉCTRICAS. CUANDO SE DE SERVICIO ES IMPORTANTE USAR PARA REEMPLAZO DE COMPONENTES CRITICOS, SOLO PARTES ESPECIFICADAS POR EL FABRICANTES. LOS COMPONENTES CRITICOS ESTAN SEÑALADOS EN LOS DIAGRAMAS POR EL SIMBOLO ⚠.

IDENTIFICACIÓN DE TERMINALES PARA TRANSISTORES EN *CHIP*



NOTAS DE LOS DIAGRAMAS

1. Las Resistencias son de Carbón de 1/4W, a menos que se indique otra característica.
2. Los Capacitores son de Cerámica para 50V, a menos que se indique otra característica.
3. El valor indicado de las Bobinas es la inductancia expresada en µH.
4. Los puntos de prueba en la terminal de algún componente son indicados por ● Los puntos de prueba fuera de los componentes se indican con ○.
5. Los componentes señalados con el símbolo ⚠ son considerados componentes críticos y deben ser reemplazados sólo con las partes especificadas por el fabricante.
6. ▬ (**LINEA GRUESA**) indica las líneas de alimentación de los Voltajes B+.
7. Los diagramas eléctricos están sujetos a cambio sin previo aviso.
8. El símbolo ⏚ indica que es una conexión a **Tierra Caliente** y el símbolo ⊥ indica conexión a **Tierra Fría**.

NOTA: Los demas símbolos de componentes incluidos son usados con fines de diseño.

MEDICIÓN DE VOLTAJES

1. Medición de voltaje:
   - El voltaje de entrada al Receptor es de 120V de Corriente Alterna. Un generador de patrones con formato NTSC se conecta a la entrada de la antena. (Patrón de Barras de Colores con 100 IREs para el Blanco y 7.5 IREs para el Negro.)
   - Los ajustes de los Menus Picture y Audio se normalizan.
     En el Menú Set-Up, en la opción ANTENA, se selecciona el modo de CABLE.
     El nivel de Volumen se minimiza.
     De los modos TV y Video, seleccionar el modo TV.
     Seleccionar modo Estereo del Audio.
   - Las mediciones de los voltajes son nominales y pueden variar hasta 10% en componentes en funcionamiento. Las lecturas de los voltajes pueden variar por la potencia de la señal y el contenido de la imagen.
   - Las fuentes de voltajes son nominales.
2. El símbolo ⏚ indica el tipo de tierra que se utiliza en la conexión del medidor.

PRECAUCION: SI no se utiliza la conexión a la tierra adecuada, se obtendrán mediciones equivocadas y podría dañar el equipo de medición.

MEDICIÓN DE FORMAS DE ONDA

1. Un símbolo como ③ indica el punto para medir una señal. (La medición puede hacerse en el punto con mayor accesibilidad, siempre que sea común al indicado.)
2. Se midieron utilizando un generador con formato NTSC conectado a la terminal de la antena. (Patrón de 8 Barras de Colores EAI, formato NTSC de 100 IREs para el Blanco y 7.5 IREs para el Negro.)
3. Los ajustes de usuario de los Menus PICTURE y AUDIO se normalizaron. Posteriormente el nivel de volumen se ajusta al mínimo.
4. Las formas de onda de Video y Color fueron tomadas con un osciloscopio de banda alta y con un punta de prueba de baja capacitancia (10 a 1). La forma y amplitud de las ondas puede variar según el tipo de osciloscopio que se utilice y sus características.
5. El símbolo de tierra ⏚ que aparece junto al número de la forma de onda, indica que se utiliza conexión a **Tierra Caliente** en el extremo negativo de la punta de prueba.

PRECAUCION: Si no se utiliza la conexión a la tierra adecuada, se obtendrán mediciones equivocadas y podría dañar el equipo de medición.

18.3. A-Board Schematic TNP2AH047AA/AB (page 1 of 4)

18.4. A-Board Schematic TNP2AH047AA/AB (page 2 of 4)

18.5. A-Board Schematic TNP2AH047AA/AB (page 3 of 4)

18.6. A-Board Schematic TNP2AH047AA/AB (page 4 of 4)

18.7. A-Board Schematic TNP2AH047FA (page 1 of 4)

18.8. A-Board Schematic TNP2AH047FA(page 2 of 4)

18.9. A-Board Schematic TNP2AH047FA (page 3 of 4)

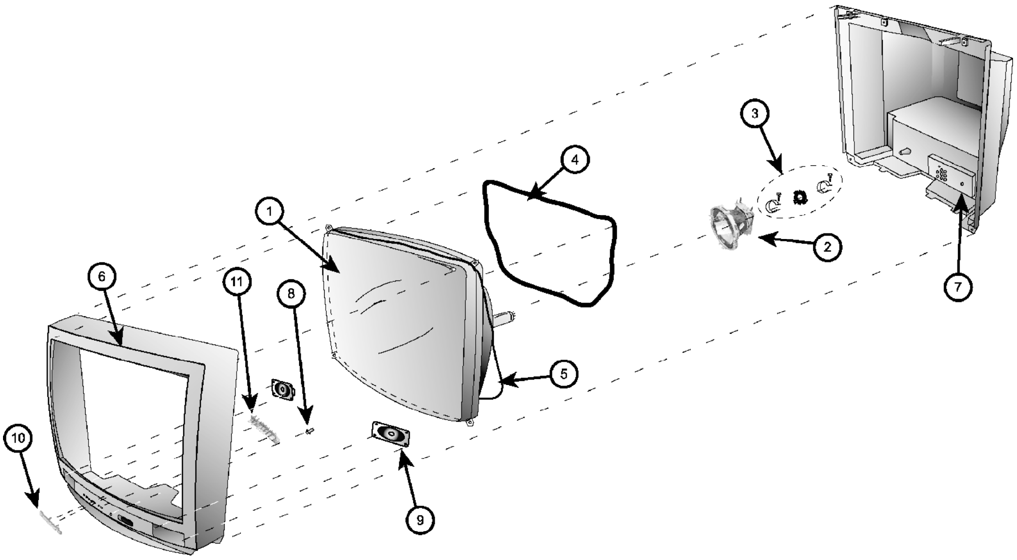
18.10. A-Board Schematic TNP2AH047FA (page 4 of 4)

18.11. C-Board Schematic TNP2AA122AA/FA

18.12. Voltages

18.13. Waveforms

19. Parts Location



20. Parts List

20.1. Parts List Notes

Important Safety Notice

Components identified by ⚠ mark have special characteristics important for safety.
When replacing any of these components, use manufacturer's specified parts.

Abbreviation of part name and description

1. Resistor
Example :
ERD25TJ104 **C** 100KΩ, **J**, 1/4W
Type Allowance

Type	Allowance
C : Carbon	F : ± 1%
F : Fuse	G : ± 2%
M : Metal Oxide Metal Film	J : ± 5% K : ± 10%
S : Solid	M : ± 20%
W : Wire Wound	

2. Capacitor
Example :
ECKF1H103ZF **C** 0.01µF, **Z**, 50V
Type Allowance

Type	Allowance
C : Carbon	C : ± 0.25pF
E : Electrolytic	D : ± 0.5pF
P : Polyester Polypropylene	F : ± 1pF G : ± 3%
T : Tantalum	J : ± 5%
	K : ± 10%
	L : ± 15%
	M : ± 20%
	P : ± 100%, -0%
	Z : ± 80%, -20%

20.2. Parts List

Ref. No.	Part No.	Part Name & Description	Remarks
CAPRISTORS			
CRA801	TP00842-51	TAPING GAP TERMINAL	⚠
CAPACITORS			
C003	ECA1HM4R7B	CAP E 4.7UF-50V	
C004	TCJ2VC1H150J	CAP C 15PF-J-50V	
C005	TCJ2VC1H150J	CAP C 15PF-J-50V	
C008	TCJ2VF1H103Z	CAP C .01UF-Z-50V	
C009	ECJ2VF1H104Z	CAP C .1UF-Z-50V	
C010	TCJ2VC1H680J	CAP C 68PF-J-50V	
C011	TCJ2VC1H680J	CAP C 68PF-J-50V	
C012	ECA1HM0R1B	CAP E 0.1UF/50V	
C013	TCJ2VC1H680J	CAP C 68PF-J-50V	
C016	ECA1AM101B	CAP E 100UF-10V	
C017	TCJ2VC1H680J	CAP C 68PF-J-50V	
C018	ECJ2VF1H103Z	CAP C .01UF-Z-50V / CT-20G8G CT-20G8SG CT-20L8G	
C018	TCJ2VF1H103Z	CAP C .01UF-Z-50V / CT-25L8G CT-25L8UG	
C019	ECA0JM102B	CAP E 1000UF-6.3V	
C020	ECA1CM102B	CAP E 1000UF/16V	
C021	TCJ2VF1H103Z	CAP C .01UF-Z-50V	
C031	TCJ2VC1H220J	CAP C 22PF-J-50V	
C032	ECA1AM470B	CAP E 47UF-10V	
C034	TCJ2VC1H390J	CAP C 39PF-J-50V	
C035	TCJ2VC1H120J	CAP C 12PF-J-50V	
C038	ECA1CM470B	CAP E 47UF/16V	

Ref. No.	Part No.	Part Name & Description	Remarks
C039	TCJ2VB1H221K	CAP C 220PF-K-50V	
C041	ECA1HM2R2B	CAP E 2.2UF-50V	
C043	ECJ2VF1C105Z	CAP C 1.0UF-Z-16V	
C044	ECA0JM102B	CAP E 1000UF-6.3V	
C046	TCJ2VF1H103Z	CAP C .01UF-Z-50V	
C048	ECJ2VF1C105Z	CAP C 1.0UF-Z-16V	
C051	ECJ2VF1C105Z	CAP C 1.0UF-Z-16V	
C052	ECA1CM101B	CAP E 100UF/16V	
C053	ECJ2VF1C105Z	CAP C 1.0UF-Z-16V	
C054	ECJ2VF1C105Z	CAP C 1.0UF-Z-16V	
C055	ECJ2VF1C105Z	CAP C 1.0UF-Z-16V	
C056	ECJ2VF1C105Z	CAP C 1.0UF-Z-16V	
C057	ECEA1CN100UB	CAP E 10UF-16V	
C058	ECEA1CN100UB	CAP E 10UF-16V	
C059	ECJ2VF1C105Z	CAP C 1.0UF-Z-16V	
C060	ECEA1CN220UB	CAP E 22UF-16V	
C061	ECA1HM100B	CAP E 10UF/50V	
C062	ECA1HM100B	CAP E 10UF/50V	
C063	ECJ2VF1C104Z	CAP C .1UF-Z-16V	
C064	ECA1CM101B	CAP E 100UF/16V	
C066	TCJ2VC1H330J	CAP C 33PF-J-50V	
C067	TCJ2VC1H680J	CAP C 68PF-J-50V	
C068	ECA1CM100B	CAP E 10UF-16V	
C070	ECJ2VF1C104Z	CAP C .1UF-Z-16V	
C071	TCJ2VF1H103Z	CAP C .01UF-Z-50V	
C072	TCJ2VB1H221K	CAP C 220PF-K-50V	
C073	TCJ2VC1H101J	CAP C 100PF-J-50V	
C077	ECA1HM100B	CAP E 10UF/50V	
C079	TCJ2VC1H220J	CAP C 22PF-J-50V	
C083	TCJ2VF1H103Z	CAP C .01UF-Z-50V	
C085	ECJ2VB1C104K	CAP C .1UF-K-16V	
C350	ECA1CM101B	CAP E 100UF/16V	
C351	TCJ2VC1H101J	CAP C 100PF-J-50V / CT-20G8G CT-20G8SG CT-20L8G	
C351	TCJ2VC1H331J	CAP C 330PF-J-50V / CT-25L8G CT-25L8UG	
C352	TCJ2VC1H101J	CAP C 100PF-J-50V / CT-20G8G CT-20G8SG CT-20L8G	
C352	TCJ2VC1H331J	CAP C 330PF-J-50V / CT-25L8G CT-25L8UG	
C353	TCJ2VC1H151J	CAP C 150PF-J-50V / CT-20G8G CT-20G8SG CT-20L8G	
C353	TCJ2VC1H331J	CAP C 330PF-J-50V / CT-25L8G CT-25L8UG	
C354	ECKW3D102KBN	CAP C .001UF-K-2KVDC	
C357	EEANA1E1R0B	CAP E 1.0UF-25V	
C359	ECA1CM471B	CAP E 470UF-16V	
C360	ECA1HM4R7B	CAP E 4.7UF-50V	
C370	ECA1HM100B	CAP E 10UF/50V / CT-25L8G CT-25L8UG	
C403	ECEA1CN220UB	CAP E 22UF-16V	
C411	ECQB1H683JF3	CAP P .068UF-J-50V	
C451	ECA1HM2R2B	CAP E 2.2UF-50V	
C452	ECA1CM220B	CAP E 22UF-16V	
C454	ECA1VHG101B	CAP E 100UF-35V	
C455	ECA1EM102E	CAP E 1000UF-25V	
C458	ECA1HM010B	CAP E 1UF-50V	
C459	ECA1VHG471E	CAP E 470UF-35V	
C460	ECQB1224KF3	CAP P .22UF-K-100V	
C461	ECQB1104JF3	CAP P .10UF-J-100V / CT-25L8G CT-25L8UG	
C462	ECJ2VF1H103Z	CAP C .01UF-Z-50V	

Ref. No.	Part No.	Part Name & Description	Remarks
C501	ECCR1H221JC5	CAP C 220PF-J-50V	
C505	ECQB1H104JF3	CAP P .10UF-J-50V	
C506	ECKR2H102KB5	CAP C 1000PF-K-500V	
C510	ECCR2H100D5	CAP C 10PF-D-500V	
C512	ECA2CM100B	CAP E 10UF-160V	
C531	ECA1HM4R7B	CAP E 4.7UF-50V	⚠
C540	TCJ2VF1H103Z	CAP C .01UF-Z-50V	
C551	ECA1VHG471B	CAP E 470UF-35V	⚠
C554	ECKR2H561KB5	CAP C 560PF-K-500V	
C555	ECA2EM220E	CAP E 22UF-250V / CT-25L8G CT-25L8UG	⚠
C555	ECA2EM470E	CAP E 47UF-250V / CT-20G8G CT-20G8SG CT-20L8G	⚠
C556	ECA1CM471B	CAP E 470UF-16V	⚠
C557	ECKR2H102KB5	CAP C 1000PF-K-500V / CT-25L8G CT-25L8UG	
C557	ECKR2H222KB5	CAP C 2200PF-K-500V / CT-20G8G CT-20G8SG CT-20L8G	
C560	ECQB1104JFW	OR ECQB1104JF3	⚠
C561	ECEA1HN010UB	CAP E 1UF/50V	
C562	ECKR2H561KB5	CAP C 560PF-K-500V	
C563	ECWH12H362JS	CAP P 3600PF-J-1.2KV / CT-20G8G CT-20G8SG CT-20L8G	⚠
C563	ECWH16622JVB	CAP P 6200PF-J-1.5KV / CT-25L8G CT-25L8UG	⚠
C564	ECWH12H822JS	CAP P .0082UF-J-1.2KV / CT-25L8G CT-25L8UG	⚠
C564	ECWH12H472JS	CAP P .0047UF-J-1.2KV / CT-20G8G CT-20G8SG CT-20L8G	⚠
C565	ECKW3D561JBR	CAP P 560PF-J-2KV / CT-25L8G CT-25L8UG	⚠
C565	ECKW3D821JBP	CAP C 820PF-J-2KV / CT-20G8G CT-20G8SG CT-20L8G	⚠
C566	ECKW3D181JBP	CAP C 180PF-J-2KV	⚠
C568	ECQM4473JZW	CAP P .047UF-J-400V / CT-20G8G CT-20G8SG CT-20L8G	⚠
C568	ECWF2224JBB	CAP P .22UF-J-200V / CT-25L8G CT-25L8UG	⚠
C569	ECWF2394JSR	CAP M .39UF-J-200V / CT-20G8G CT-20G8SG CT-20L8G	⚠
C569	ECWF2474JSR	CAP P .47UF-J-200V / CT-25L8G CT-25L8UG	⚠
C570	ECA1CM221B	CAP E 10UF-16V	
C571	ECA1CM220B	CAP E 22UF-16V	
C572	ECA0JM221B	CAP E 220UF-6.3V	
C573	ECA1CM101B	CAP E 100UF/16V	
C575	ECKR2H471KB5	CAP C 470PF-K-500V	
C593	ECA1CM470B	CAP E 47UF/16V	
C605	TCJ2VF1H103Z	CAP C .01UF-Z-50V	
C606	ECA0JM221B	CAP E 220UF-6.3V	
C800	ECKR3A152KBP	CAP C 1500PF-K-1KVDC	
C801	ECKWAE472ZED	CAP C 4700PF-Z-500V	⚠
C802	ECKWAE472ZED	CAP C 4700PF-Z-500V	⚠
C803	ECKWAE472ZED	CAP C 4700PF-Z-500V	⚠
C805	EC0S2DA221BB	CAP E 220UF/200V / CT-20G8G CT-20G8SG CT-20L8G	⚠
C805	EC0S2DA331BB	CAP E 330UF/200V / CT-25L8G CT-25L8UG	⚠
C806	ECQM4103KZW	CAP P .01UF-K-400V	
C808	ECA1HM470B	CAP E 47UF-50V	
C809	ECKR1H102KB5	CAP C .001UF-K-50V / CT-25L8G CT-25L8UG	
C809	ECKR1H152KB5	CAP C 1500PF-K-50V / CT-20G8G CT-20G8SG CT-20L8G	
C810	ECKR1H471KB5	CAP C 470PF-K-50V	

Ref. No.	Part No.	Part Name & Description	Remarks
C812	ECQU2A224MVA	CAP P .22UF-M-250VAC	⚠
C813	ECQU2A153MVA	CAP P .015UF-M-250VAC	⚠
C814	ECQU2A153MVA	CAP P .015UF-M-250VAC	⚠
C820	ECA1CM101B	CAP E 100UF/16V	
C821	TCJ2VF1H103Z	CAP C .01UF-Z-50V	
C822	ECKR3A221KBP	CAP C 220PF-K-1KV	
C823	ECA1VM471B	CAP E 470UF-35V	⚠
C824	ECKR3A102KBP	CAP C 1000PF-K-1KV	
C825	EEUMG2C221S	CAP E 220UF-160V	⚠
C826	ECKR3A471KBP	CAP C 470PF-K-1KV	
C827	ECA1CM102B	CAP E 1000UF/16V	
C828	ECA160V33UE	CAP E 33UF/160V	⚠
C829	ECA1CM471B	CAP E 470UF-16V	
C830	ECA1CM471B	CAP E 470UF-16V	
C2201	ECA1HM4R7B	CAP E 4.7UF-50V	
C2202	ECA1HM2R2B	CAP E 2.2UF-50V	
C2203	ECA1HM4R7B	CAP E 4.7UF-50V	
C2204	AP106K016CAE	CAP T 10UF/16V	
C2205	ECA1HMR33B	CAP E .33UF-50V	
C2206	ECQB1H223JF3	CAP P .022UF-J-50V	
C2207	AP335K016CAE	CAP T 3.3UF/16V	
C2208	ECJ2VB1C104K	CAP C .1UF-K-16V	
C2209	ECJ2VB1C104K	CAP C .1UF-K-16V	
C2210	ECJ2VB1C104K	CAP C .1UF-K-16V	
C2212	ECQB1H473JF3	CAP P .047UF-J-50V	
C2213	ECA1HMR47B	CAP E .47UF-50V	
C2214	ECA1AM101B	CAP E 100UF-10V	
C2215	EEANA1E100B	CAP E 10UF-25V	
C2216	TCJ2VC1H100D	CAP C 10PF-J-50V	
C2217	ECJ2VB1H102K	CAP C .001UF-K-50V	
C2218	ECJ2VB1H102K	CAP C .001UF-K-50V	
C2219	ECJ2VF1C105Z	CAP C 1.0UF-Z-16V	
C2220	ECJ2VF1C105Z	CAP C 1.0UF-Z-16V	
C2301	ECA1EM102E	CAP E 1000UF-25V	
C2302	ECA1HM010B	CAP E 1UF-50V	
C2304	ECA1CM101B	CAP E 100UF/16V	
C2307	ECA1CM102B	CAP E 1000UF/16V	
C2308	ECKR1H103ZF3	CAP C .01UF-Z-50V	
C2312	ECA1HM010B	CAP E 1UF-50V	
C2313	ECA1EM220B	CAP E 22UF-25V	
C2317	ECA1CM102B	CAP E 1000UF/16V	
C2350	ECA1CM101B	CAP E 100UF/16V	
C3001	ECA1CM220B	CAP E 22UF-16V	
C3002	ECA1CM220B	CAP E 22UF-16V	
C3011	ECJ2VF1C105Z	CAP C 1.0UF-Z-16V	
C3012	ECA1HM010B	CAP E 1UF-50V	
C3013	ECA1CM100B	CAP E 10UF-16V	
C3014	ECA1CM100B	CAP E 10UF-16V	
C3018	ECA1HM010B	CAP E 1UF-50V	
C3019	ECJ2VF1C105Z	CAP C 1.0UF-Z-16V	
C3025	ECA1HM100B	CAP E 10UF/50V	
C3234	ECA1CM470B	CAP E 47UF/16V	

Ref. No.	Part No.	Part Name & Description	Remarks
C3240	TCJ2VF1H103Z	CAP C .01UF-Z-50V	
DIODES			
D001	MAZ30680ML	DIODE	
D002	MA2C165001VT	DIODE	
D003	MAZ30510HL	DIODE	
D006	MAZ33000HL	DIODE	
D007	MAZ30510HL	DIODE	
D010	MAZ40510MF	DIODE ZENER	
D055	MAZ40330MF	DIODE ZENER	
D360	MA2C165001VT	DIODE	
D380	MA2C029WBF	DIODE	
D451	B0EAKL000008	DIODE RECTIFIER	
D452	MA2C165001VT	DIODE	
D505	D1NL40V70	DIODE	
D531	MA2C165001VT	DIODE	⚠
D551	B0HAMM000072	DIODE FAST RECOVERY	⚠
D554	AU02V0	DIODE	⚠
D556	MA2C165001VT	DIODE	
D557	MAZ40270LF	DIODE ZENER	
D558	B0HANV000008	DIODE	
D559	EU2	DIODE	
D561	AU02V0	DIODE	⚠
D606	MA2C165001VT	DIODE	
D801	D3SBA60-4103	DIODE	⚠
D803	MAZ41200MF	DIODE ZENER	
D806	TAP2AA0003	PTC 3-OHM	⚠
D808	SARS01V1	DIODE	
D809	B0HAJP000015	DIODE	
D810	B0HAJP000015	DIODE	
D811	B0HAJP000015	DIODE	
D820	MA2C165001VT	DIODE	
D821	MAZ40470HF	DIODE ZENER	
D822	B0HAMM000103	DIODE	
D823	S3L60P154004	DIODE	⚠
D824	B0HAMM000072	DIODE FAST RECOVERY	
D2302	MAZ43000MF	DIODE ZENER	
D2305	CVS20A120MTA	DIODE	
D2307	CVS20A120MTA	DIODE	
D2350	MAZ40910LF	DIODE	
D2355	MAZ30510HL	DIODE	
D3001	MAZ40510MF	DIODE ZENER	
D3004	CVS20A120MTA	DIODE	
D3005	CVS20A120MTA	DIODE	
D3007	MAZ31100ML	DIODE ZENER	
D3008	MAZ31100ML	DIODE ZENER	
D3009	MAZ31100ML	DIODE ZENER	
D3010	MAZ31100ML	DIODE ZENER	
D3011	MAZ31100ML	DIODE ZENER	
D3012	MAZ31100ML	DIODE ZENER	
D3017	MAZ31100ML	DIODE ZENER	
D3018	MAZ31100ML	DIODE ZENER	
D3019	CVS20A120MTA	DIODE	

Ref. No.	Part No.	Part Name & Description	Remarks
D3021	CVS20A120MTA	DIODE	
D3023	MAZ31100ML	DIODE ZENER	
D3024	MAZ31100ML	DIODE ZENER	
		FUSES	
F801	XBA2A00101	FUSE 6.3A 125V	⚠
		INTEGRATED CIRCUITS	
IC001	MN101E03GTB3	MPU	
IC002	TVR2AJ165S	EEPROM / CT-20G8G CT-20G8SG	
IC002	TVR2AJ166S	EEPROM / CT-20L8G CT-25L8G CT-25L8UG	
IC003	GP1UE282GK	IR SENSOR	
IC004	PST9128NR	RESET	
IC005	PQ3RD13	3.3V STBY REGULATOR	
IC451	AN5522	VERTICAL OUT AMP	
IC501	NC7SZU04M5X	H-DRIVE INVERTER	
IC551	AN78M09LB	9V VOLTAGE REGULATOR	
IC552	AN78M05LB	5V VOLTAGE REGULATOR	
IC801	STRW5634	MAIN POWER SUPPLY	⚠
IC802	0N3171RLF	OPTO-COUPLER	⚠
IC2201	AN5829S-E1V	MTS	
IC2301	AN17807A	AUDIO AMP	
IC3001	MM1114XFBE	VIDEO SWITCH	
		COILS	
L002	EXCELSA39V	FERRITE BEAD	
L003	EXCELDR35V	FERRITE BEAD	
L005	EXCELSA35V	FERRITE BEAD	
L006	EXCELSA35T	FERRITE BEAD	
L007	ELESN330JA	COIL PEAKING 33UH	
L008	G0C470KA0029	COIL PEAKING 47UH	
L010	G0C2R2KA0029	COIL PEAKING 2.2UH	
L011	EXCELSA26T	FERRITE BEAD	
L012	G0C2R2KA0029	COIL PEAKING 2.2UH	
L013	EXCELSA26T	FERRITE BEAD	
L014	ELESN180KA	COIL PEAKING 18UH	
L015	ELESN3R3JA	COIL PEAKING 3.3UH	
L020	EXCELSA26T	FERRITE BEAD	
L023	EXCELSA26T	FERRITE BEAD / CT-25L8G CT-25L8UG	
L032	EXCELSA26T	FERRITE BEAD	
L108	EXCELSA35V	FERRITE BEAD	
L110	G0C101KA0021	COIL PEAKING 100UH	
L245	EXCELSA35V	FERRITE BEAD	
L312	EXCELSA24T	FERRITE BEAD	
L351	G0C101KA0021	COIL PEAKING 100UH / CT-25L8G CT-25L8UG	
L551	ELH5L4101	COIL / CT-20G8G CT-20G8SG CT-20L8G	⚠
L551	ELH5L6128	COIL HORIZ. LINEARITY / CT-25L8G CT-25L8UG	⚠
L552	EXCELSA39V	FERRITE BEAD	
L801	ELF15N011A	COIL / CT-20G8G CT-20G8SG CT-20L8G	⚠
L801	ELF21V018A	COIL / CT-25L8G CT-25L8UG	⚠
L802	ELEIN680KA	COIL PEAKING 68UH / CT-20G8G CT-20G8SG CT-20L8G	
L802	TALL08T470KA	COIL / CT-25L8G CT-25L8UG	
L803	TALL08T680KA	COIL	
L804	EXCELDR35V	FERRITE BEAD / CT-20G8G CT-20G8SG CT-20L8G	
L805	EXCELDR35V	FERRITE BEAD / CT-20G8G CT-20G8SG CT-20L8G	

Ref. No.	Part No.	Part Name & Description	Remarks
L806	EXCELDR35V	FERRITE BEAD	
L807	EXCELSA35V	FERRITE BEAD	
L808	EXCELSA35V	FERRITE BEAD	
L809	EXCELDR35V	FERRITE BEAD / CT-25L8G CT-25L8UG	
L810	EXCELDR35V	FERRITE BEAD / CT-25L8G CT-25L8UG	
L2301	EXCELDR35V	FERRITE BEAD / CT-20L8G CT-25L8G CT-25L8UG	
L2303	EXCELSA39T	FERRITE BEAD / CT-25L8G CT-25L8UG	
L2305	EXCELSA35V	FERRITE BEAD	
TRANSISTORS			
Q001	2SD601ARTX	TRANSISTOR	
Q057	2SB709ARTX	TRANSISTOR	
Q058	2SB709ARTX	TRANSISTOR	
Q070	2SD601ARTX	TRANSISTOR	
Q092	2SB709ARTX	TRANSISTOR	
Q351	2SC3063RL	TRANSISTOR	
Q352	2SC3063RL	TRANSISTOR	
Q353	2SC3063RL	TRANSISTOR	
Q354	2SD601ARTX	TRANSISTOR	
Q355	2SD601ARTX	TRANSISTOR	
Q356	2SD601ARTX	TRANSISTOR	
Q357	2SD601ARTX	TRANSISTOR	
Q358	2SD601ARTX	TRANSISTOR	
Q359	2SD601ARTX	TRANSISTOR	
Q360	2SB709ARTX	TRANSISTOR	
Q361	2SB709ARTX	TRANSISTOR	
Q362	2SB709ARTX	TRANSISTOR	
Q411	2SB0710AQL	TRANSISTOR	
Q412	2SD0602AQL	TRANSISTOR	
Q451	2SB709ARTX	TRANSISTOR	
Q501	2SC1573AH	TRANSISTOR	
Q501	2SC4212HLB	TRANSISTOR / CT-25L8G CT-25L8UG	
Q551	2SC562200VLK	TRANSISTOR / CT-20G8G CT-20G8SG CT-20L8G	⚠
Q551	2SC5902000LK	TRANSISTOR / CT-25L8G CT-25L8UG	⚠
Q560	2SB709ARTX	TRANSISTOR	
Q605	2SB709ARTX	TRANSISTOR	
Q606	2SD601ARTX	TRANSISTOR	
Q801	2SD601ARTX	TRANSISTOR	
Q802	2SD601ARTX	TRANSISTOR	
Q820	2SA1767QTA	TRANSISTOR	
Q830	2SB1011QRL	TRANSISTOR	
Q831	2SC1473ATA	TRANSISTOR	
Q2350	2SB709ARTX	TRANSISTOR	
Q3001	2SD601ARTX	TRANSISTOR	
Q3002	2SD601ARTX	TRANSISTOR	
RELAYS			
RL801	K6B1AGA00042	RELAY	⚠
RESISTORS			
J327	ERDS2TJ471T	RES C 470-J-1/2W	
R001	ERJ6GEYJ103V	RES M 10K-J-1/10W	
R004	ERJ6GEYJ562V	RES M 5.6K-J-1/10W	
R005	ERJ6GEYJ471V	RES M 470-J-1/10W	
R007	ERJ6GEYJ471V	RES M 470-J-1/10W	
R008	ERJ6GEYJ223V	RES M 22K-J-1/10W	

Ref. No.	Part No.	Part Name & Description	Remarks
R009	ERJ6GEYJ102V	RES M 1K-J-1/10W	
R014	ERJ6GEYJ472V	RES M 4.7K-J-1/10W	
R015	ERJ6GEYJ472V	RES M 4.7K-J-1/10W	
R016	ERJ6GEYJ221V	RES M 220-J-1/10W	
R017	ERJ6GEYJ221V	RES M 220-J-1/10W	
R018	ERJ6GEYJ472V	RES M 4.7K-J-1/10W	
R019	ERJ6GEYJ472V	RES M 4.7K-J-1/10W	
R020	ERJ6GEYJ221V	RES M 220-J-1/10W	
R021	ERJ6GEYJ101V	RES M 100-J-1/10W	
R022	ERJ6GEYJ101V	RES M 100-J-1/10W	
R023	ERJ6GEYJ102V	RES M 1K-J-1/10W	
R024	ERJ6GEYJ101V	RES M 100-J-1/10W	
R025	ERJ6GEYJ101V	RES M 100-J-1/10W	
R026	ERDS1FJ561P	RES C 560-J-1/2W	
R032	ERJ6GEYJ103V	RES M 10K-J-1/10W	
R033	ERJ6GEYJ222V	RES M 2.2K-J-1/10W	
R034	ERJ6GEYJ222V	RES M 2.2K-J-1/10W	
R035	ERJ6GEYJ332V	RES M 3.3K-J-1/10W	
R036	ERJ6GEYJ512V	RES M 5.1K-J-1/10W	
R037	ERJ6GEYJ912V	RES M 9.1K-J-1/10W	
R038	ERJ6GEYJ223V	RES M 22K-J-1/10W	
R039	ERDS2TJ102T	RES C 1K-J-1/4W	
R040	ERJ6GEYJ680V	RES M 68-J-1/10W	
R041	ERJ6GEYJ222V	RES M 2.2K-J-1/10W	
R042	ERJ6GEYJ222V	RES M 2.2K-J-1/10W	
R043	ERJ6GEYJ153V	RES M 15K-J-1/10W	
R044	ERJ6GEYJ101V	RES M 100-J-1/10W	
R045	ERDS2TJ101T	RES C 100-J-1/4W	
R046	ERJ6GEYJ102V	RES M 1K-J-1/10W	
R047	ERJ6GEYJ472V	RES M 4.7K-J-1/10W	
R048	ERJ6GEYJ101V	RES M 100-J-1/10W	
R050	ERJ6GEYJ102V	RES M 1K-J-1/10W	
R052	ERJ6GEYJ103V	RES M 10K-J-1/10W	
R053	ERJ6GEYJ101V	RES M 100-J-1/10W	
R055	ERJ6GEYJ103V	RES M 10K-J-1/10W	
R056	ERJ6GEYJ471V	RES M 470-J-1/10W	
R057	ERJ6GEYJ101V	RES M 100-J-1/10W	
R060	ERJ6GEYJ101V	RES M 100-J-1/10W	
R061	ERJ6GEYJ221V	RES M 220-J-1/10W	
R062	ERJ6GEYJ472V	RES M 4.7K-J-1/10W	
R063	ERDS2TJ101T	RES C 100-J-1/4W	
R064	ERJ6GEYJ473V	RES M 47K-J-1/10W	
R065	ERDS2TJ101T	RES C 100-J-1/4W	
R066	ERJ6GEYJ223V	RES M 22K-J-1/10W	
R067	ERJ6GEYJ223V	RES M 22K-J-1/10W	
R068	ERJ6GEYJ103V	RES M 10K-J-1/10W	
R069	ERJ6GEYJ123V	RES M 12K-J-1/10W	
R070	ERJ6GEYJ561V	RES M 560-J-1/10W	
R071	ERJ6GEYJ680V	RES M 68-J-1/10W	
R072	ERJ6GEYJ222V	RES M 2.2K-J-1/10W	
R073	ERJ6GEYJ471V	RES M 470-J-1/10W	
R074	ERJ6GEYJ471V	RES M 470-J-1/10W	
R075	ERJ6ENF3902V	RES M 39K-F-1/10W	
R076	ERJ6ENF6201V	RES M 6.2K-F-1/10W	

Ref. No.	Part No.	Part Name & Description	Remarks
R077	ERJ6GEYJ103V	RES M 10K-J-1/10W	
R078	ERJ6GEYJ103V	RES M 10K-J-1/10W	
R080	ERJ6GEYJ183V	RES M 18K-J-1/10W	
R081	ERJ6GEYJ153	RES M 15K-J-1/10	
R082	ERJ6GEYJ183V	RES M 18K-J-1/10W	
R083	ERJ6GEYJ153V	RES M 15K-J-1/10W	
R084	ERDS2TJ182T	RES C 1.8K-J-1/4W	
R087	ERDS2TJ221T	RES C 220-J-1/4W	
R088	ERJ6GEYJ223V	RES M 22K-J-1/10W	
R092	ERJ6GEYJ473V	RES M 47K-J-1/10W	
R093	ERJ6GEYJ331V	RES M 330-J-1/10W	
R351	ERG2FJ123H	RES M 12K-J-2W	
R352	ERG2FJ123H	RES M 12K-J-2W	
R353	ERG2FJ123H	RES M 12K-J-2W	
R354	ERC12GK272C	RES C 2.7K-K-1/2W	
R355	ERC12GK272C	RES C 2.7K-K-1/2W	
R356	ERC12GK272C	RES C 2.7K-K-1/2W	
R357	ERJ6ENF3300V	RES M 330-F-1/10W	
R358	ERJ6ENF3300V	RES M 330-F-1/10W	
R359	ERJ6ENF3300V	RES M 330-F-1/10W	
R360	ERJ6ENF1101V	RES M 1.1K-F-1/10W / CT-20G8G CT-20G8SG CT-20L8G	
R360	ERJ6ENF9100V	RES M 910-F-1/10W / CT-25L8G CT-25L8UG	
R361	ERJ6ENF1101V	RES M 1.1K-F-1/10W / CT-20G8G CT-20G8SG CT-20L8G	
R361	ERJ6ENF9100V	RES M 910-F-1/10W / CT-25L8G CT-25L8UG	
R362	ERJ6ENF1101V	RES M 1.1K-F-1/10W / CT-20G8G CT-20G8SG CT-20L8G	
R362	ERJ6ENF9100V	RES M 910-F-1/10W / CT-25L8G CT-25L8UG	
R363	ERJ6GEYJ101V	RES M 100-J-1/10W	
R364	ERJ6GEYJ101V	RES M 100-J-1/10W	
R365	ERJ6GEYJ101V	RES M 100-J-1/10W	
R369	ERDS2TJ393T	RES C 39K-J-1/4W / CT-25L8G CT-25L8UG	
R370	ERDS2TJ224T	RES C 220K-J-1/4W / CT-25L8G CT-25L8UG	
R371	ERJ6GEYJ101V	RES M 100-J-1/10W	
R372	ERJ6GEYJ101V	RES M 100-J-1/10W	
R373	ERJ6GEYJ101V	RES M 100-J-1/10W	
R374	ERJ6GEYJ102V	RES M 1K-J-1/10W	
R375	ERJ6GEYJ102V	RES M 1K-J-1/10W	
R376	ERJ6GEYJ102V	RES M 1K-J-1/10W	
R377	ERJ6ENF3300V	RES M 330-F-1/10W	
R378	ERJ6ENF3300V	RES M 330-F-1/10W	
R379	ERJ6ENF3300V	RES M 330-F-1/10W	
R380	ERJ6ENF1501V	RES M 1.5K-F-1/10W	
R381	ERJ6ENF1501V	RES M 1.5K-F-1/10W	
R382	ERJ6ENF1501V	RES M 1.5K-F-1/10W	
R383	ERJ6ENF3481V	RES M 3.48K-F-1/10W	
R384	ERJ6ENF7500V	RES M 750-F-1/10W	
R385	ERDS1FJ150P	RES C 15-J-1/2W	
R389	ERJ6GEYJ102V	RES M 1K-J-1/10W	
R390	ERJ6GEYJ102V	RES M 1K-J-1/10W	
R391	ERJ6GEYJ102V	RES M 1K-J-1/10W	
R411	ERJ6GEYJ682V	RES M 6.8K-J-1/10W	
R412	ERJ6GEYJ471V	RES M 470-J-1/10W	
R413	ERJ6GEYJ103V	RES M 10K-J-1/10W	
R414	ERJ6GEYJ471V	RES M 470-J-1/10W	
R451	ERDS1FJ1R0P	RES C 1.0-J-1/2W / CT-25L8G CT-25L8UG	

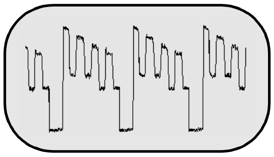
Ref. No.	Part No.	Part Name & Description	Remarks
R451	ERDS1FJ1R2P	RES C 1.2-J-1/2W / CT-20G8G CT-20G8SG CT-20L8G	
R453	ERJ6GEYJ333V	RES M 33K-J-1/10W	
R454	ERJ6GEYJ243V	RES M 24K-J-1/10W / CT-20G8G CT-20G8SG CT-20L8G	
R454	ERJ6GEYJ363V	RES M 36K-J-1/10W / CT-25L8G CT-25L8UG	
R455	ERJ6GEYJ103V	RES M 10K-J-1/10W	
R456	ERG3FJ151	RES M 150-J-3W	
R457	ERDS1FJ1R0P	RES C 1.0-J-1/2W	
R458	ERJ6GEYJ123V	RES M 12K-J-1/10W	
R459	ERJ6GEYJ122V	RES M 1.2K-J-1/10W / CT-20G8G CT-20G8SG CT-20L8G	
R459	ERJ6GEYJ152V	RES M 1.5K-J-1/10W / CT-25L8G CT-25L8UG	
R462	ERJ6GEYJ472V	RES M 4.7K-J-1/10W	
R463	ERJ6GEYJ473V	RES M 47K-J-1/10W	
R464	ERJ6GEYJ103V	RES M 10K-J-1/10W	
R468	ERJ6ENF1962V	RES M 19.6K-F-1/10W	
R469	ERJ6ENF5621V	RES M 5.62K-F-1/10W	
R471	ERJ6GEYJ223V	RES M 22K-J-1/10W / CT-25L8G CT-25L8UG	
R471	ERJ6GEYJ333V	RES M 33K-J-1/10W / CT-20G8G CT-20G8SG CT-20L8G	
R504	ERDS2TJ102T	RES C 1K-J-1/4W	
R505	ERJ6GEYJ562V	RES M 5.6K-J-1/10W	
R506	ERG1SJ562P	RES M 5.6K-J-1W	
R507	ER0S2THF1802	RES M 18K-F-1/4W	⚠
R509	ERJ6ENF1002V	RES M 10K-F-1/10W	⚠
R510	ERG3FJ472	RES M 4.7K-J-3W / CT-20G8G CT-20G8SG CT-20L8G	⚠
R510	ERG3FJ622	RES M 6.2K-J-3W / CT-25L8G CT-25L8UG	⚠
R511	ERG3FJ622	RES M 6.2K-J-3W / CT-25L8G CT-25L8UG	⚠
R512	ERJ6GEYJ222V	RES M 2.2K-J-1/10W	
R514	ERJ6GEYJ392V	RES M 3.9K-J-1/10W	
R515	ERDS2TJ101T	RES C 100-J-1/4W	
R532	ERJ6ENF2202V	RES M 22K-F-1/10W	⚠
R533	ERJ6ENF1003V	RES M 100K-F-1/10W	⚠
R540	ERJ6GEYJ105V	RES M 1M-J-1/10W	
R541	ERDS2TJ274T	RES C 27K-J-1/4W	
R542	ERJ6GEYJ124V	RES M 120K-J-1/10W	
R551	ERX12SJR47P	RES M .47-J-1/2W	⚠
R552	ERDS1FJ1R0T	RES C 1.0-J-1/2W	⚠
R557	ERJ6GEYJ103V	RES M 10K-J-1/10W	
R558	ERQ1CKPR56S	RES F .56-K-1W / CT-25L8G CT-25L8UG	⚠
R558	ERQ2CJP1R5S	RES F 1.5-J-2W / CT-20G8G CT-20G8SG CT-20L8G	⚠
R559	ERG2FJ683H	RES M 12K-J-2W	
R561	ERG2FJ102H	RES M 1K-J-2W	
R562	ERG2FJ270H	RES M 27-J-2W	
R563	ERG3FJ150H	RES M 15-J-3W	
R564	ERDS2TJ104T	RES C 100K-J-1/4W	
R565	ERDS2TJ393T	RES C 39K-J-1/4W / CT-25L8G CT-25L8UG	
R565	ER0S2TKF9762	RES M 97.6K-F-1/4W / CT-20G8G CT-20G8SG CT-20L8G	
R592	ERJ6GEYJ472V	RES M 4.7K-J-1/10W	
R605	ERDS2TJ103T	RES C 10K-J-1/4W	
R606	ERJ6GEYJ562V	RES M 5.6K-J-1/10W	
R607	ERJ6GEYJ102V	RES M 1K-J-1/10W	
R608	ERJ6GEYJ104V	RES M 100K-J-1/10W	

Ref. No.	Part No.	Part Name & Description	Remarks
R801	ERF7ZK1R5	RES W 1.5-K-7 / CT-25L8G CT-25L8UG	
R802	ERG2FJ104H	RES M 100K-J-2W	
R804	ERG1DJ224P	RES M220K-J-1W	
R805	ERX2FZJR15H	RES M .18-J-2W	⚠
R806	ERX12SJ1R5P	RES M 1.5-J-1/2W	⚠
R807	ERDS2TJ681T	RES C 680-J-1/4W	
R808	ERX12SJ1R5P	RES M 1.5-J-1/2W	
R809	ERDS2TJ472T	RES C 4.7K-J-1/4	
R810	ERDS2TJ221T	RES C 220-J-1/4W	
R815	ERC12ZGK825D	RES C 8.2MEG-K-1/2W	⚠
R817	ERX3FJ6R8	RES M 6.8-J-3W / CT-20G8G CT-20G8SG CT-20L8G	⚠
R821	ERDS1FJ1R0T	RES C 1.0-J-1/2W / CT-25L8G CT-25L8UG	
R821	ERDS1FJ1R5T	RES C 1.5-J-1/2W / CT-20G8G CT-20G8SG CT-20L8G	
R822	ERDS1FJ1R0T	RES C 1.0-J-1/2W / CT-25L8G CT-25L8UG	
R822	ERDS1FJ1R5T	RES C 1.5-J-1/2W / CT-20G8G CT-20G8SG CT-20L8G	
R823	ERDS1FJ272T	RES C 2.7K-J-1/2W	
R824	ERDS2TJ223T	RES C 22K-J-1/4W	
R825	ERDS2TJ272T	RES C 2.7K-J-1/4W	
R827	ERJ6GEYJ153V	RES M 15K-J-1/10W	
R828	ERJ6GEYJ104V	RES M 100K-J-1/10W	
R829	ERJ6GEYJ104V	RES M 100K-J-1/10W	
R830	ERG2FJ273H	RES M 27K-J-2W	
R831	ERDS2TJ682T	RES C 6.8K-J-1/4W	
R832	ERJ6GEYJ122V	RES M 1.2K-J-1/10W / CT-25L8G CT-25L8UG	
R832	ERJ6GEYJ512V	RES M 5.1K-J-1/10W / CT-20G8G CT-20G8SG CT-20L8G	
R833	ERJ6GEYJ473V	RES M 47K-J-1/10W	
R834	ERJ6GEYJ472V	RES M 4.7K-J-1/10W	
R837	ERJ6GEYJ103V	RES M 10K-J-1/10W	
R838	ERJ6GEYJ103V	RES M 10K-J-1/10W	
R850	ERQ12HJR22P	RES F .22-J-1/2W / CT-25L8G CT-25L8UG	⚠
R850	ERQ12HJR56P	RES F .56-J-1/2W / CT-20G8G CT-20G8SG CT-20L8G	⚠
R202	ERJ6GEYJ222V	RES M 2.2K-J-1/10W	
R2201	ERJ6GEYJ224V	RES M 220K-J-1/10W	
R2203	ERJ6GEYJ272V	RES M 2.7K-J-1/10W	
R2204	ERJ6GEYJ272V	RES M 2.7K-J-1/10W	
R2205	ERDS2TJ101T	RES C 100-J-1/4W	
R2206	ERDS2TJ273T	RES C 27K-J-1/4W	
R2207	ERJ6GEYJ152V	RES M 1.5K-J-1/10W	
R2208	ERJ6GEYJ152V	RES M 1.5K-J-1/10W	
R2301	ERQ2CJP5R6S	RES F 5.6-J-2W / CT-20G8G CT-20G8SG CT-20L8G	
R2351	ERJ6GEYJ102V	RES M 1K-J-1/10W	
R2352	ERJ6GEYJ152V	RES M 1.5K-J-1/10W	
R2357	ERJ6GEYJ472V	RES M 4.7K-J-1/10W	
R2370	ERJ6GEYJ222V	RES M 2.2K-J-1/10W	
R3002	ERJ6GEYJ221V	RES M 220-J-1/10W	
R3003	ERJ6GEYJ221V	RES M 220-J-1/10W	
R3004	ERDS2TJ101T	RES C 100-J-1/4W	
R3005	ERJ6GEYJ334V	RES M 330K-J-1/10W	
R3006	ERJ6GEYJ151V	RES M 150-J-1/10W	
R3007	ERJ6GEYJ151V	RES M 150-J-1/10W	
R3008	ERJ6ENF75R0V	RES M 75.0-F-1/10W	
R3009	ERJ6GEYJ682V	RES M 6.8K-J-1/10W	

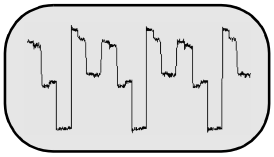
Ref. No.	Part No.	Part Name & Description	Remarks
R3010	ERJ6GEYJ334V	RES M 330K-J-1/10W	
R3011	ERJ6GEYJ682V	RES M 6.8K-J-1/10W	
R3012	ERDS2TJ101T	RES C 100-J-1/4W	
R3013	ERJ6ENF75R0V	RES M 75.0-F-1/10W	
R3014	ERJ6ENF75R0V	RES M 75.0-F-1/10W	
R3015	ERJ6ENF75R0V	RES M 75.0-F-1/10W	
R3016	ERDS2TJ181T	RES C 180-J-1/4W	
R3017	ERDS2TJ181T	RES C 180-J-1/4W	
R3018	ERDS2TJ101T	RES C 100-J-1/4W	
R3019	ERJ6GEYJ682V	RES M 6.8K-J-1/10W	
R3020	ERJ6GEYJ682V	RES M 6.8K-J-1/10W	
R3021	ERDS2TJ101T	RES C 100-J-1/4W	
R3022	ERDS2TJ101T	RES C 100-J-1/4W	
R3023	ERDS2TJ101T	RES C 100-J-1/4W	
R3024	ERDS2TJ101T	RES C 100-J-1/4W	
R3026	ERDS2TJ101T	RES C 100-J-1/4W	
R3027	ERDS2TJ101T	RES C 100-J-1/4W	
R3034	ERJ6GEYJ471V	RES M 470-J-1/10W	
R3035	ERJ6GEYJ562V	RES M 5.6K-J-1/10W	
R3036	ERJ6GEYJ183V	RES M 18K-J-1/10W	
R3037	ERJ6GEYJ471V	RES M 470-J-1/10W	
R3038	ERJ6GEYJ562V	RES M 5.6K-J-1/10W	
R3039	ERJ6GEYJ183V	RES M 18K-J-1/10W	
R3041	ERJ6GEYJ472V	RES M 4.7K-J-1/10W	
R3042	ERJ6GEYJ472V	RES M 4.7K-J-1/10W	
R3101	ERJ6GEYJ334V	RES M 330K-J-1/10W	
R3102	ERJ6GEYJ334V	RES M 330K-J-1/10W	
R3103	ERJ6GEYJ334V	RES M 330K-J-1/10W	
R3104	ERJ6GEYJ334V	RES M 330K-J-1/10W	
SWITCHES			
S001	EVQPF106K	SWITCH	
S002	EVQPF106K	SWITCH	
S003	EVQPF106K	SWITCH	
S004	EVQPF106K	SWITCH	
S005	EVQPF106K	SWITCH	
S008	EVQPF106K	SWITCH	
S009	EVQPF106K	SWITCH	
TRANSFORMERS			
T501	ETH19Y211AZ	TRASMFORMER	
T551	TLF2AA004	TRANSFORMER FLYBACK / CT-25L8G CT-25L8UG	⚠
T551	ZTFN32501A	TRANSFORMER FLYBACK / CT-20G8G CT-20G8SG CT-20L8G	⚠
T801	ETS29AS1N5NC	TRANSFORMER / CT-20G8G CT-20G8SG CT-20L8G	⚠
T801	SRW35EC-U07V	TRANSFORMER SWITCHING / CT-25L8G CT-25L8UG	⚠
T3001	TF0402B04P03	TRANSFORMER	
T3002	TF0402B04P03	TRANSFORMER	
CRYSTALS / FILTERS			
X001	A1100005BD	CRYSTAL	
OTHERS			
TNR001	ENG36621G	TUNER	⚠
M001	TSX2AA0361	LINE CORD AC	
M002	TJSC00300	CRT SOCKET	

Ref. No.	Part No.	Part Name & Description	Remarks
1	A51KQK99X01	CRT 20 INCH, DEFLECTION YOKE, PURITY AND CONVERGENCE RINGS / CT-20G8G CT-20G8SG CT-20L8G	⚠
	A63QDB891X	CRT 25 INCH / CT-25L8G CT-25L8UG	⚠
2	TLY2AA027	DEFLECTION YOKE / CT-25L8G CT-25L8UG	⚠
3	JH291U-009	PURITY AND CONVERGENCE RINGS / CT-25L8G CT-25L8UG	
4	TSP2AA008	COIL DEGAUSSING / CT-20G8G CT-20G8SG CT-20L8G	⚠
	TSP2AA028	COIL DEGAUSSING / CT-25L8G CT-25L8UG	⚠
5	TXF3A01BA3	ASSY. DAG GND / CT-20G8G CT-20G8SG CT-20L8G	
	TXF3A01DF3	ASSY. DAG GND / CT-25L8G CT-25L8UG	
M003	TMM2A30702	WEDGE YOKE	
M004	0FMK014ZZ	CONVERGENCE CORRECTOR STRIP	
M005	TSN40007	MAGNET PURITY / CT-25L8G CT-25L8UG	
M006	TSN63115-4	MAGNET PURITY / CT-20G8G CT-20G8SG CT-20L8G	
6	TXFKY13GSER	ASSY CABINET FRONT / CT-20G8G	
	TXFKY14GSER	ASSY CABINET FRONT / CT-20L8G	
	TXFKY15GSER	ASSY CABINET FRONT / CT-20G8SG	
	TXFKY16GSER	ASSY CABINET FRONT / CT-25L8G CT-25L8UG	
7	TXFKU11GSER	ASSY CABINET BACK / CT-20G8G CT-20G8SG CT-20L8G	
	TXFKU12FSER	ASSY CABINET BACK / CT-25L8G CT-25L8UG	
8	TKX2AA00401	IR GUIDE / CT-20G8G CT-20G8SG CT-20L8G	
	TKX2AA00403	IR GUIDE / CT-25L8G CT-25L8UG	
9	TAS2AA0012	SPEAKER 16-OHM 1.5W	
10	TBM2A10141	BADGE PANASONIC / CT-20G8G	
	TBM2A10143	BADGE PANASONIC / CT-20G8SG CT-20L8G CT-25L8G CT-25L8UG	
11	TBX2AA1303G	BUTTON 7-KEY / CT-25L8G CT-25L8UG	
	TBX2AA1701GS	BUTTON 7-KEY / CT-20G8G	
	TBX2AA1702G	BUTTON 7-KEY / CT-20L8G	
	TBX2AA1702GS	BUTTON 7-KEY / CT-20G8SG	
JK3001	TJB2AA0221	TERMINAL A/V 8P / CT-20L8G CT-25L8G CT-25L8UG	
JK3001	TJB2A9064B	ASSY. JACK A/V / CT-20G8G CT-20G8SG	
JK3002	TJB2AA0046	TERMINAL FRONT A/V	
JK3003	TJB2AA0171	TERMINAL S-VIDEO / CT-20G8G CT-20G8SG	
OTHER ACCESSORIES			
M007	TQB2AA0452-1	OWNERS MANUAL / CT-20G8G CT-20G8SG CT-20L8G	
M008	TQB2AA0461	OWNERS MANUAL / CT-25L8G CT-25L8UG	
M009	EUR7713010	REMOTE CONTROL	
M010	UR77EC1303A	BATTERY COVER REMOTE CONTROL	

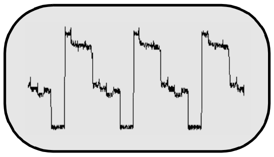
A-Board



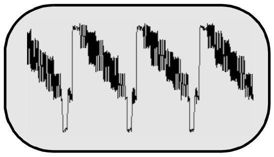
① **4 Vp-p**
A11 PIN 3 (BLUE OUT)



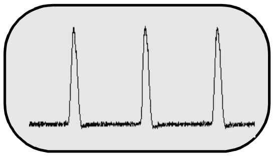
② **4 Vp-p**
A11 PIN 1 (RED OUT)



③ **4.32 V-p**
A11 PIN 2 (GREEN OUT)



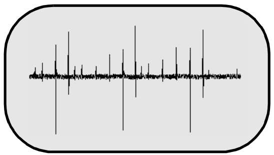
④ **1.3 Vp-p**
TPA5 (VIDEO)



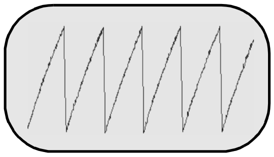
⑤ **3.28 Vp-p**
IC001 PIN 36 (FBP IN)

10MHz X'tal

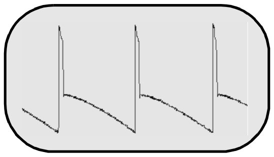
⑥
IC001 PIN 50 (OSC)



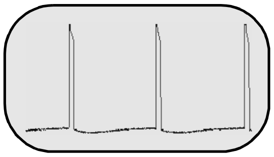
⑦ **600mv Vp-p**
IC451 PIN 1 (VERT IN)



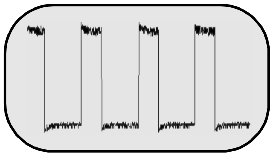
⑧ **3.88 Vp-p**
Q4111 B (V DRIVE)



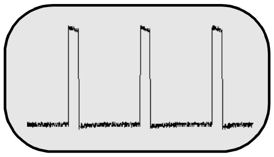
⑨ **56.8 Vp-p**
IC451 PIN 5(V OUT)



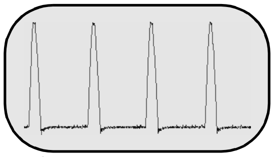
⑩ **28 Vp-p**
IC451 PIN 3 (PUMP UP)



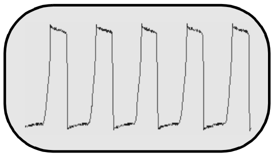
⑪ **3.20 Vp-p**
IC501 PIN 4 (H-DRIVE)



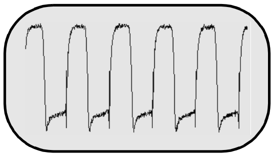
⑫ **114 Vp-p**
A12 PIN 2 (HEATER)



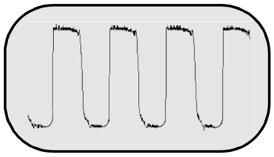
⑬ **1.18 kVp-p**
Q551 Collector (H OUT)



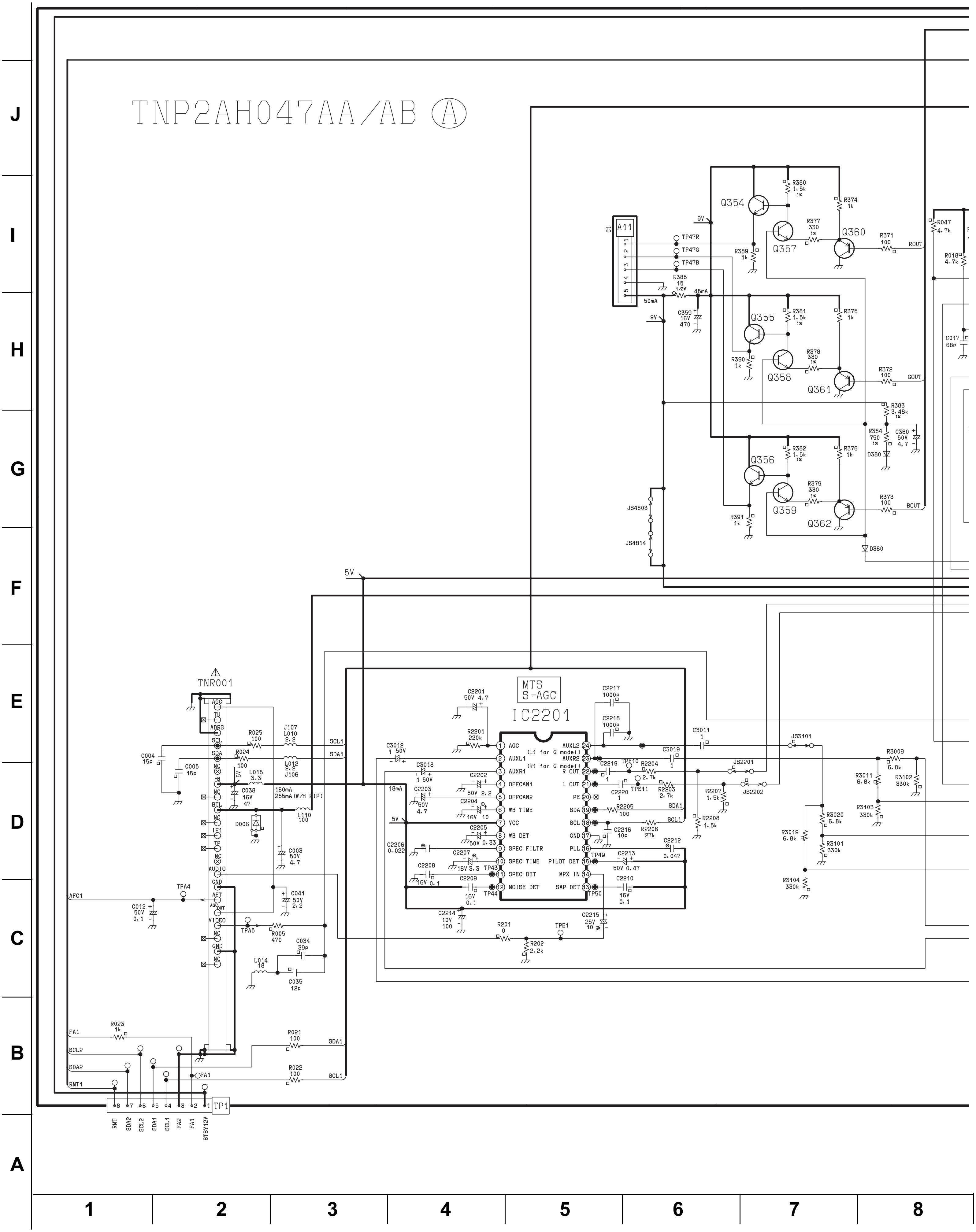
⑭ **356 Vp-p**
IC801 PIN 1

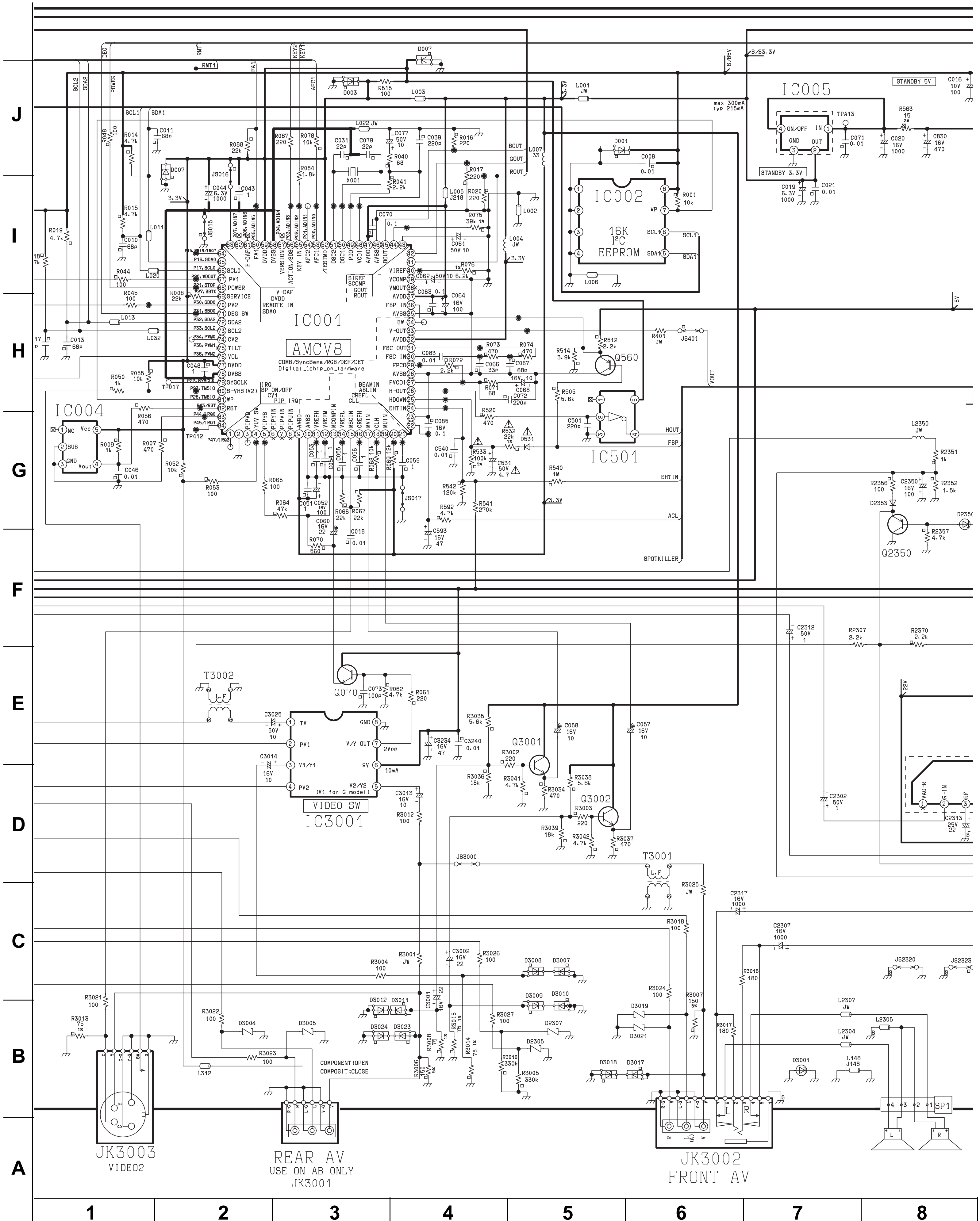


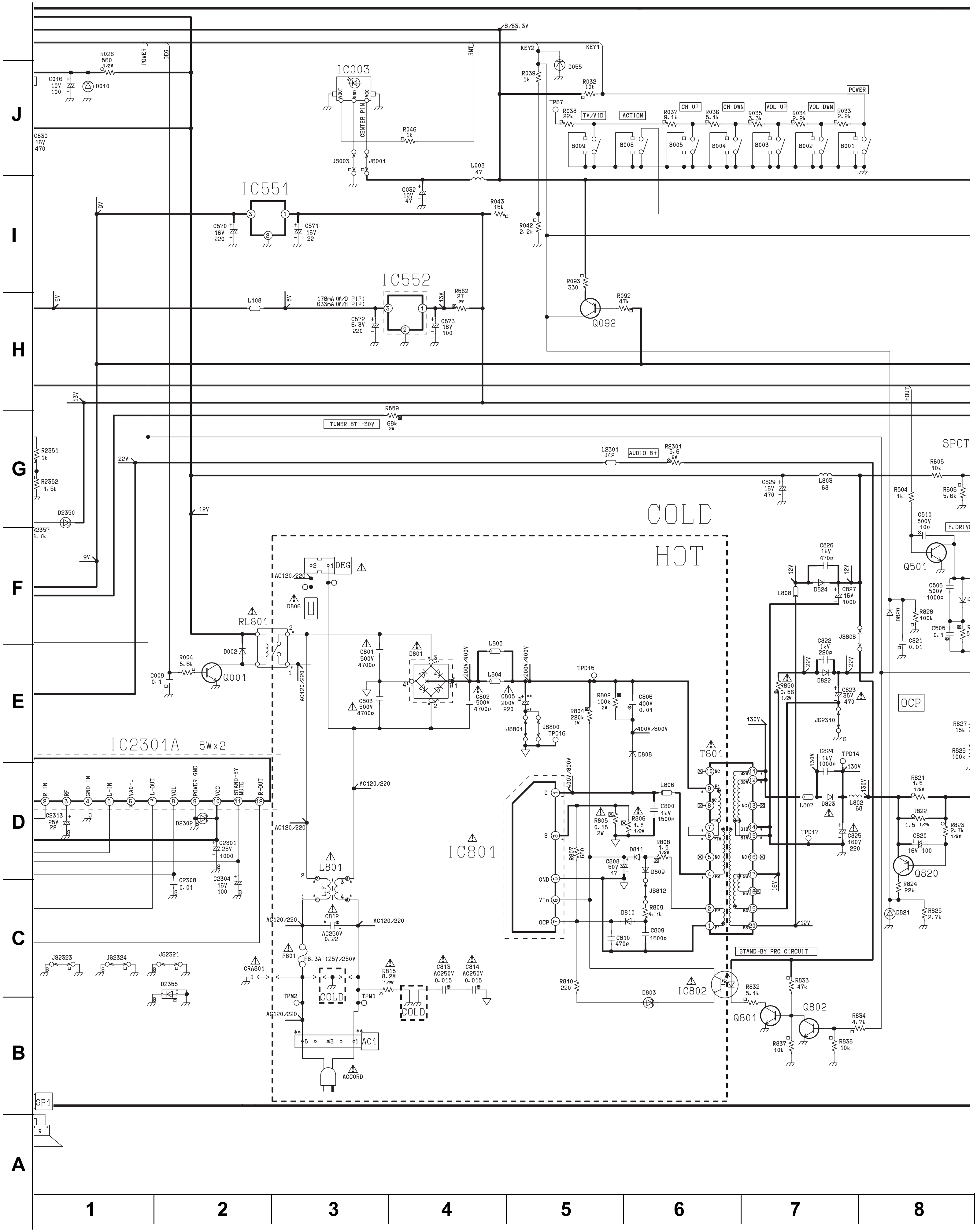
⑮ **2.88 Vp-p**
IC801 PIN 7



⑯ **114 Vp-p**
Q501 Collector

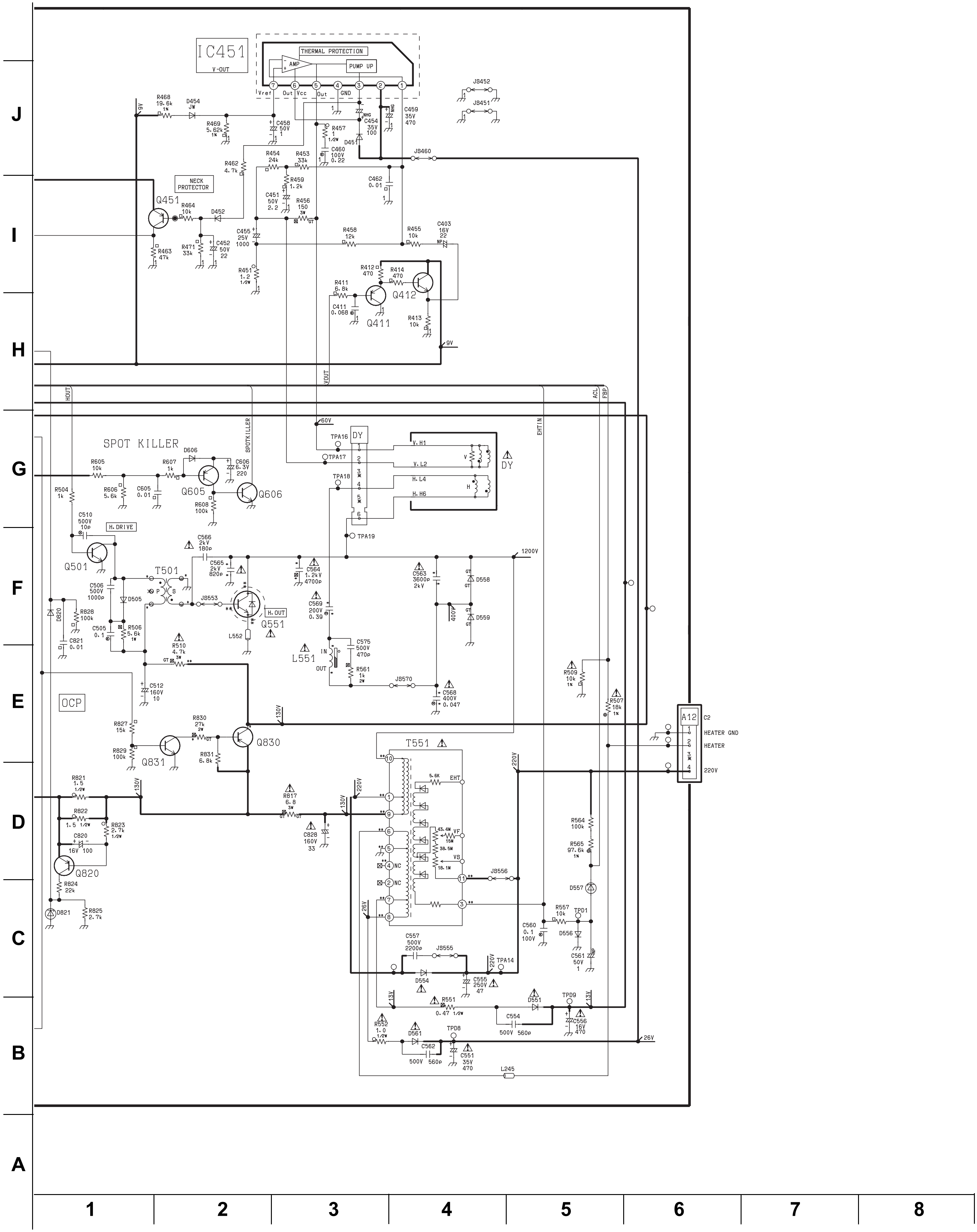

TNP2AH047AA/AB Ⓐ
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
A11
C1
TP47R
TP47G
TP47B
R385 15 1/2W
50mA
45mA
9V
C359 16V 470
Q354
Q357
Q360
Q355
Q358
Q361
Q356
Q359
Q362
R380 1.5k 1%
R374 1k
R377 330 1%
R371 100
ROUT
R389 1k
R381 1.5k 1%
R375 1k
R378 330 1%
R372 100
GOUT
R390 1k
R383 3.48k 1%
R384 750 1%
C360 50V 4.7
D380
R382 1.5k 1%
R376 1k
R379 330 1%
R373 100
BOUT
R391 1k
D360
R047 4.7k
R018 4.7k
C017 68p
JS4803
JS4814
5V
TNR001
AGC
TU
ADRS
SCL
SDA
NC
+B
BTL
IF1
TP
AUDIO
GND
AFT
AGC OUT
VIDEO
C004 15p
C005 15p
R025 100
R024 100
J107 L010 2.2
L012 2.2 J106
SCL1
SDA1
L015 3.3
C038 16V 47
160mA 255mA (W/H PIP)
L110 100
D006
C003 50V 4.7
C041 50V 2.2
TPA4
AFC1
C012 50V 0.1
TPA5
R005 470
C034 39p
L014 18
C035 12p
FA1
R023 1k
SCL2
SDA2
RMT1
R021 100
R022 100
TP1
RMT
STBY12V
FA2
MTS S-AGC
IC2201
C2201 50V 4.7
R2201 220k
C3012 1 50V
C3018 1 50V
C2202 50V 2.2
C2203 50V 4.7
C2204 16V 10
18mA
C2205 50V 0.33
C2206 0.022
C2207 16V 3.3
C2208 16V 0.1
C2209 16V 0.1
TP43
TP44
C2214 10V 100
R201 0
R202 2.2k
TPE1
C2215 25V 10 NA
AGC
AUXL1
AUXR1
OFFCAN1
OFFCAN2
WB TIME
VCC
WB DET
SPEC FILTR
SPEC TIME
SPEC DET
NOISE DET
AUXL2
AUXR2
(L1 for G model)
(R1 for G model)
R OUT
L OUT
PE
SDA
SCL
GND
PLL
PILOT DET
MPX IN
SAP DET
C2217 1000p
C2218 1000p
C2219 1
TPE10
R2204 2.7k
C2220 1
TPE11
R2203 2.7k
R2205 100
R2206 27k
C2216 10p
C2212 0.047
TP49
C2213 50V 0.47
C2210 16V 0.1
TP50
C3011 1
C3019 1
JS3101
JS2201
JS2202
R2207 1.5k
R2208 1.5k
R3009 6.8k
R3011 6.8k
R3102 330k
R3103 330k
R3020 6.8k
R3101 330k
R3019 6.8k
R3104 330k

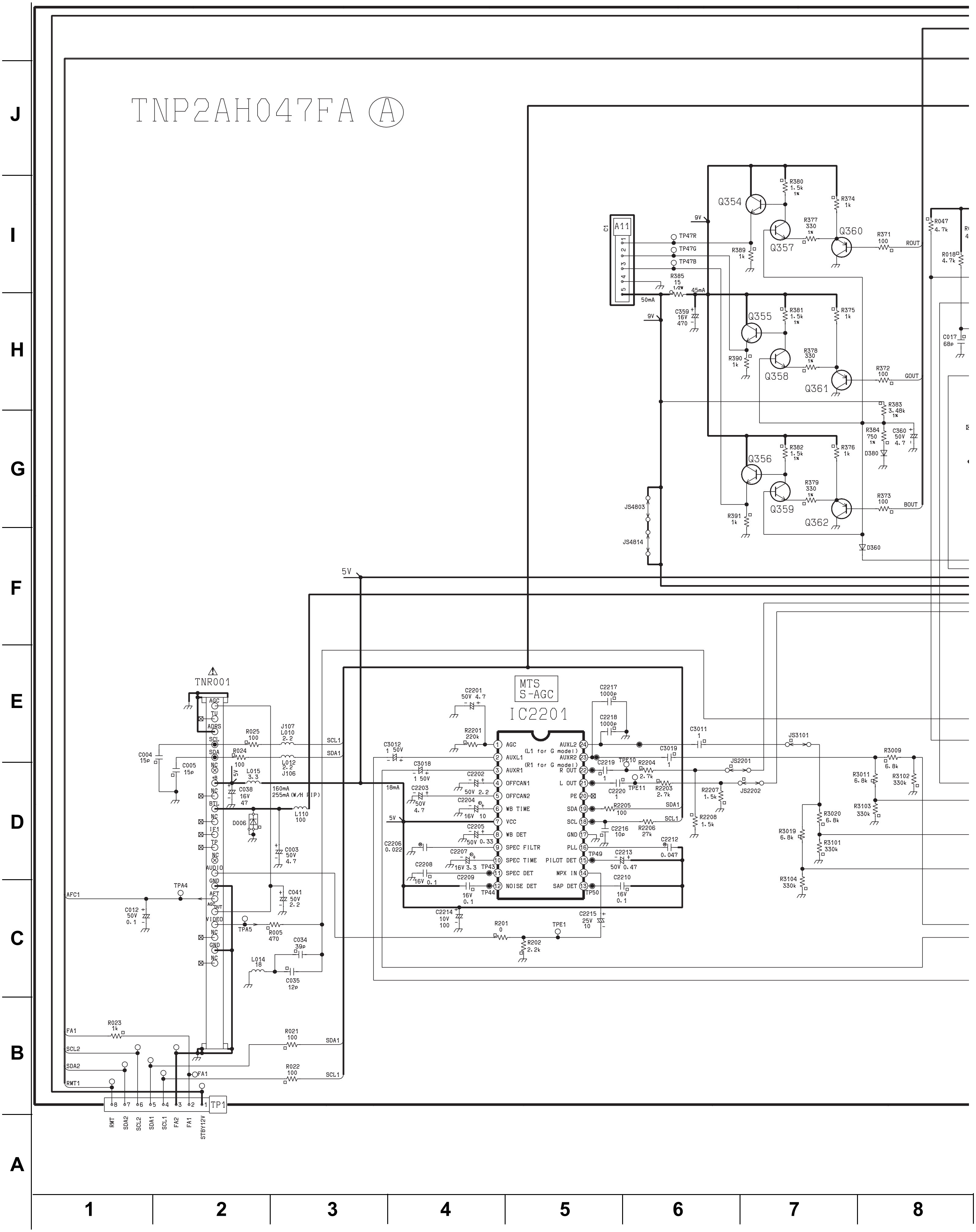

IC001
AMCV8
COMB/Sync Sepa/RGB/DEF/DET
Digital_1chip_on_farmware
IC002
16K
I²C
EEPROM
IC005
STANDBY 5V
STANDBY 3.3V
IC004
IC501
Q560
Q070
Q3001
Q3002
Q2350
T3002
T3001
L.F
IC3001
VIDEO SW
(V1 for G model)
COMPONENT:OPEN
COMPOSIT:CLOSE
JK3003
VIDEO2
REAR AV
USE ON AB ONLY
JK3001
JK3002
FRONT AV
SP1
BOUT
GOUT
ROUT
HOUT
FBP
EHTIN
ACL
SPOTKILLER
VOUT
max 300mA
typ 215mA
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8

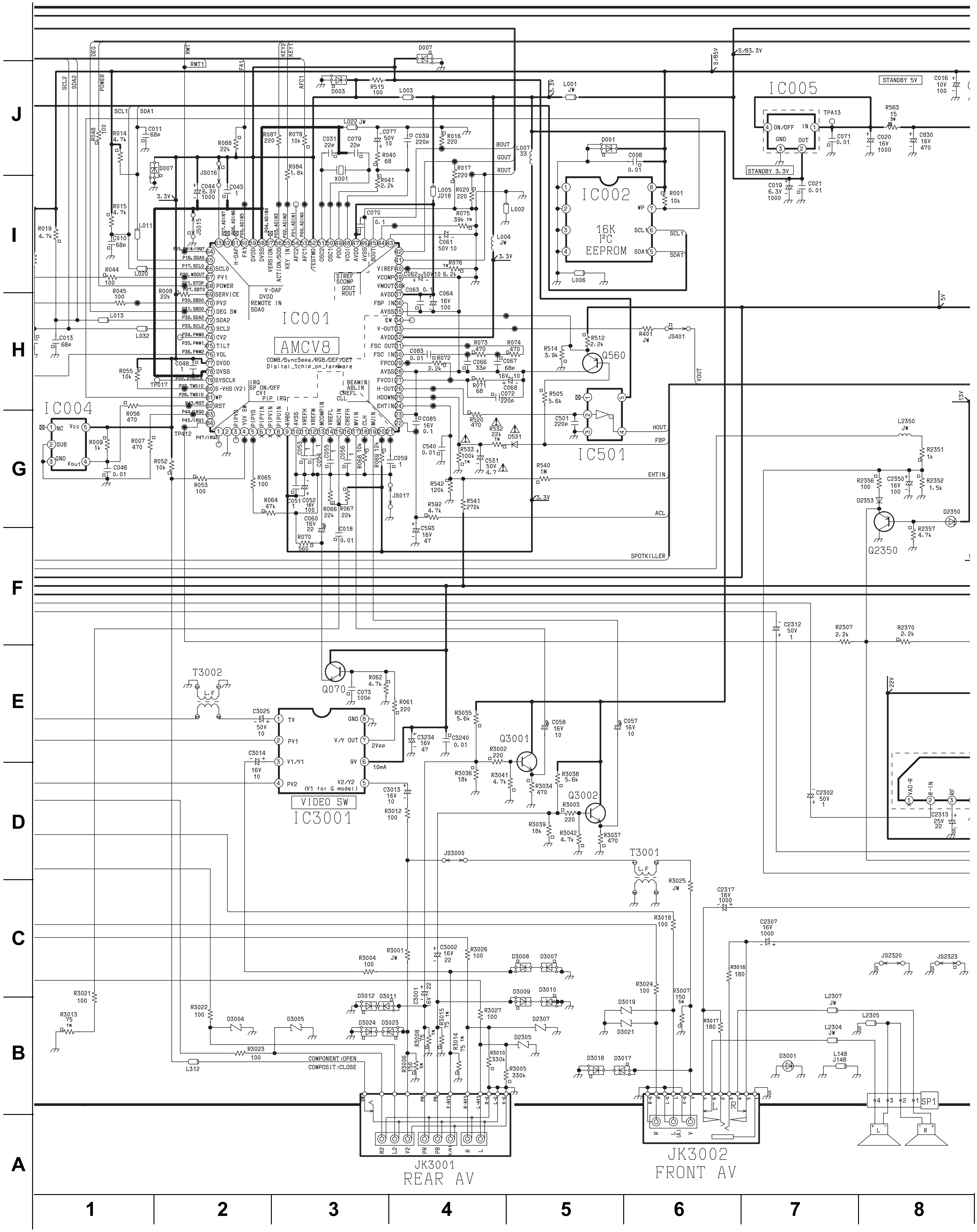


J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
S/B3.3V
KEY2
KEY1
R026 560 1/2W
POWER
DEG
RMT
IC003
CENTER PIN
C016 10V 100
D010
C830 16V 470
R039 1k
D055
R032 10k
POWER
TP87
R038 22k
TV/VID
ACTION
R037 9.1k
CH UP
R036 5.1k
CH DWN
R035 3.3k
VOL UP
R034 2.2k
VOL DWN
R033 2.2k
S009
S008
S005
S004
S003
S002
S001
R046 1k
JS003
JB001
L008 47
C032 10V 47
IC551
9V
C570 16V 220
C571 16V 22
R043 15k
R042 2.2k
R093 330
Q092
R092 47k
IC552
5V
L108
178mA (W/O PIP)
633mA (W/H PIP)
13V
R562 27 2W
C572 6.3V 220
C573 16V 100
R559 68k 2W
TUNER BT +30V
HOUT
R2351 1k
R2352 1.5k
22V
L2301 J42
AUDIO B+
R2301 5.6 2W
SPOT
R605 10k
R606 5.6k
C829 16V 470
L803 68
R504 1k
12V
D2350
R2357 4.7k
COLD
HOT
C510 500V 10p
H.DRIVE
Q501
DEG
AC120/220
D806
RL801
D002
R004 5.6k
Q001
C009 0.1
C801 500V 4700p
D801
C803 500V 4700p
200V/400V
L805
L804
C802 500V 4700p
C805 200V 220
TPD15
R802 100k 2W
C806 400V 0.01
R804 220k 1W
JS801
JS800
TPD16
400V/800V
D808
C826 1kV 470p
L808
D824
C827 16V 1000
C506 500V 1000p
D820
R828 100k
C821 0.01
C505 0.1
JS806
C822 1kV 220p
D822
R850 0.56 1/2W
C823 35V 470
OCP
JS2310
130V
R827 15k
R829 100k
IC2301A 5Wx2
R-IN
RF
GND IN
L-IN
VAO-L
L-OUT
VOL
POWER GND
VCC
STAND-BY MUTE
R-OUT
C2313 25V 22
D2302
C2301 25V 1000
C2308 0.01
C2304 16V 100
AC120/220
L801
IC801
D
S
GND
Vin
OCP
L806
C800 1kV 1500p
R805 0.15 2W
R806 1.5 1/2W
R807 680
C808 50V 47
D811
R808 1.5 1/2W
D809
JS812
R809 4.7k
D810
C810 470p
C809 1500p
T801
C824 1kV 1000p
TPD14
L807
D823
L802 68
R821 1.5 1/2W
R822 1.5 1/2W
R823 2.7k 1/2W
C820 16V 100
TPD17
C825 160V 220
Q820
R824 22k
D821
R825 2.7k
16V
12V
C812 AC250V 0.22
F801 F6.3A 125V/250V
CRA801
COLD
R815 8.2M 1/2W
C813 AC250V 0.015
C814 AC250V 0.015
TPM2
TPM1
AC1
ACCORD
STAND-BY PRC CIRCUIT
IC802
R810 220
D803
R832 5.1k
R833 47k
Q801
Q802
R834 4.7k
R837 10k
R838 10k
JS2323
JS2324
JS2321
D2355
SP1
R

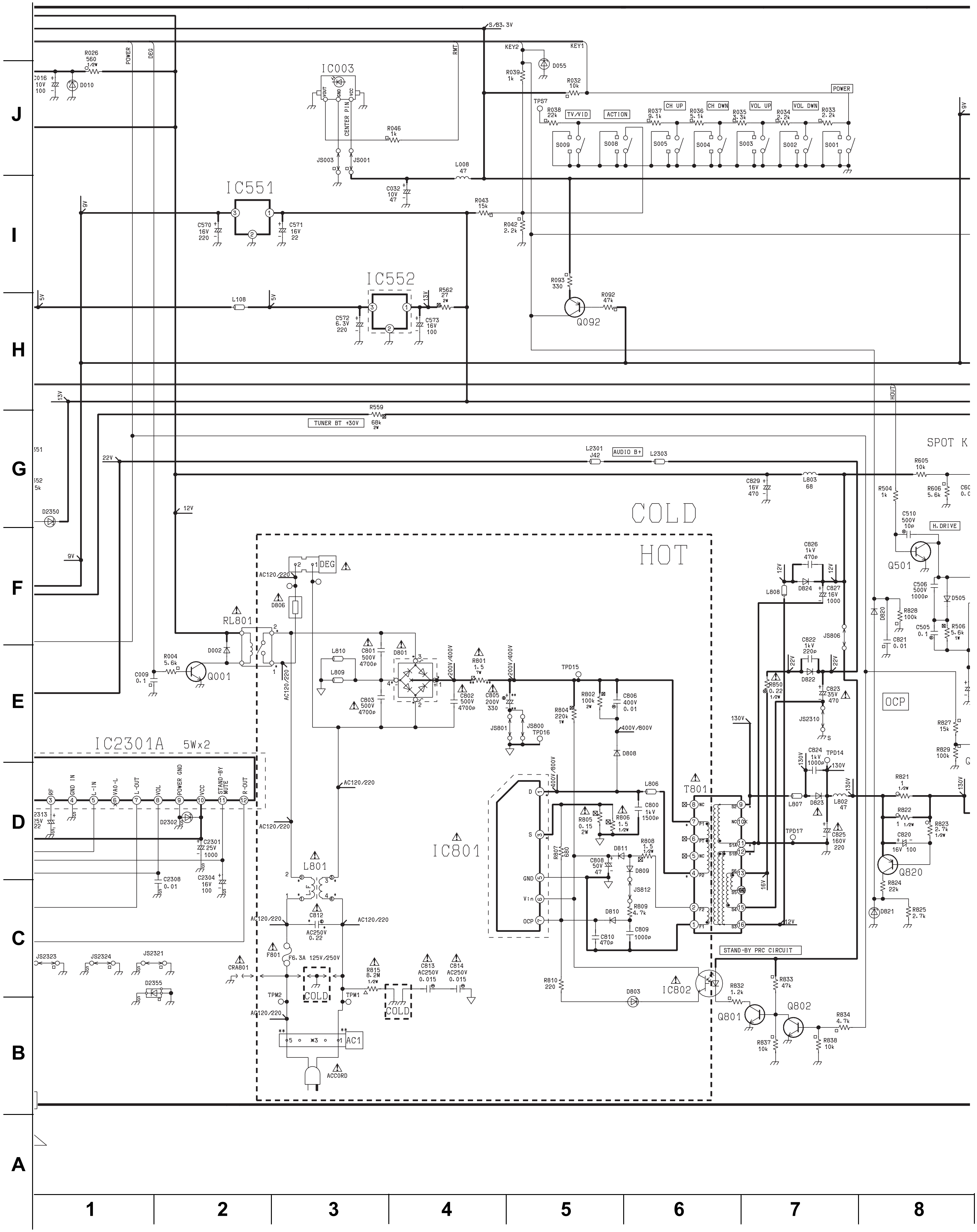
A-BOARD 3 of 4 TNP2AH047AA/AB CT-20L8G / CT-20G8G / CT-20G8SG


IC451
V-OUT
THERMAL PROTECTION
AMP
PUMP UP
Vref
Out
Vcc
Out
GND
R468 19.6k 1%
D454 JW
R469 5.62k 1%
C458 50V 1
R457 1 1/2W
C460 100V 0.22
C454 35V 100
D451
C459 35V 470
JS452
JS451
JS460
R462 4.7k
R454 24k
R453 33k
R459 1.2k
C451 50V 2.2
R456 150 3W
C462 0.01
NECK PROTECTOR
Q451
R464 10k
D452
C455 25V 1000
R458 12k
R455 10k
C403 16V 22
R463 47k
R471 33k
C452 50V 22
R451 1.2 1/2W
R412 470
R414 470
R411 6.8k
C411 0.068
Q411
Q412
R413 10k
9V
HOUT
VOUT
SPOTKILLER
EHTIN
ACL
FBP
60V
SPOT KILLER
R605 10k
R607 1k
D606
C606 6.3V 220
R606 5.6k
C605 0.01
Q605
Q606
R608 100k
R504 1k
TPA16
TPA17
TPA18
DY
V.H1
V.L2
H.L4
H.H6
TPA19
C510 500V 10p
H.DRIVE
Q501
C566 2kV 180p
C565 2kV 820p
C564 1.2kV 4700p
C563 3600p 2kV
1200V
D558
D559
400V
T501
C506 500V 1000p
D505
JS553
Q551
H.OUT
L552
C505 0.1
R506 5.6k 1W
D820
R828 100k
C821 0.01
C569 200V 0.39
C575 500V 470p
L551
IN
OUT
R561 1k 2W
JS570
C568 400V 0.047
R510 4.7k 3W
C512 160V 10
R509 10k 1%
R507 18k 1%
OCP
R827 15k
R829 100k
Q831
R830 27k 2W
R831 6.8k
Q830
130V
T551
A12
C2
HEATER GND
HEATER
220V
EHT
VF
VS
43.4M
15M
38.5M
18.1M
5.6K
R821 1.5 1/2W
R822 1.5 1/2W
R823 2.7k 1/2W
C820 16V 100
Q820
R824 22k
R825 2.7k
D821
R817 6.8 3W
C828 160V 33
NC
JS556
R564 100k
R565 97.6k 1%
D557
26V
R557 10k
TPD1
C560 0.1 100V
D556
C561 50V 1
C557 500V 2200p
JS555
TPA14
D554
C555 250V 47
13V
R551 0.47 1/2W
D551
TPD9
C554 500V 560p
C556 16V 470
R552 1.0 1/2W
D561
TPD8
C562 500V 560p
C551 35V 470
L245
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8


TNP2AH047FA Ⓐ
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
C1
A11
TP47R
TP47G
TP47B
R385 15 1/2W
45mA
50mA
9V
C359 16V 470
Q354
Q355
Q356
Q357
Q358
Q359
Q360
Q361
Q362
R380 1.5k 1%
R381 1.5k 1%
R382 1.5k 1%
R374 1k
R375 1k
R376 1k
R377 330 1%
R378 330 1%
R379 330 1%
R389 1k
R390 1k
R391 1k
R371 100
R372 100
R373 100
ROUT
GOUT
BOUT
R383 3.48k 1%
R384 750 1%
C360 50V 4.7
D380
D360
R047 4.7k
R018 4.7k
C017 68p
JS4803
JS4814
5V
MTS S-AGC
IC2201
AGC
AUXL1
AUXR1
OFFCAN1
OFFCAN2
WB TIME
VCC
WB DET
SPEC FILTR
SPEC TIME
SPEC DET
NOISE DET
AUXL2
(L1 for G model)
AUXR2
(R1 for G model)
R OUT
L OUT
PE
SDA
SCL
GND
PLL
PILOT DET
MPX IN
SAP DET
C2201 50V 4.7
R2201 220k
C3012 1 50V
C3018 1 50V
C2202 50V 2.2
C2203 50V 4.7
C2204 16V 10
C2205 50V 0.33
C2206 0.022
C2207 16V 3.3
C2208 16V 0.1
C2209 16V 0.1
C2214 10V 100
C2215 25V 10
C2217 1000p
C2218 1000p
C2219 1
C2220 1
C2216 10p
C2212 0.047
C2213 50V 0.47
C2210 16V 0.1
R2204 2.7k
R2203 2.7k
R2205 100
R2206 27k
R2207 1.5k
R2208 1.5k
R201 0
R202 2.2k
TPE1
TPE10
TPE11
TP43
TP44
TP49
TP50
18mA
C3011 1
C3019 1
JS3101
JS2201
JS2202
R3009 6.8k
R3011 6.8k
R3102 330k
R3103 330k
R3020 6.8k
R3019 6.8k
R3101 330k
R3104 330k
⚠ TNR001
AGC
TU
ADRS
SCL
SDA
NC
+B
BTL
IF1
TP
AUDIO
GND
AFT
AGC OUT
VIDEO
R025 100
R024 100
J107 L010 2.2
L012 2.2 J106
C004 15p
C005 15p
L015 3.3
C038 16V 47
160mA 255mA (W/H PIP)
L110 100
D006
C003 50V 4.7
C041 50V 2.2
TPA4
AFC1
C012 50V 0.1
TPA5
R005 470
C034 39p
L014 18
C035 12p
SCL1
SDA1
FA1
SCL2
SDA2
RMT1
R023 1k
R021 100
R022 100
FA1
TP1
RMT
SDA2
SCL2
SDA1
SCL1
FA2
FA1
STBY12V

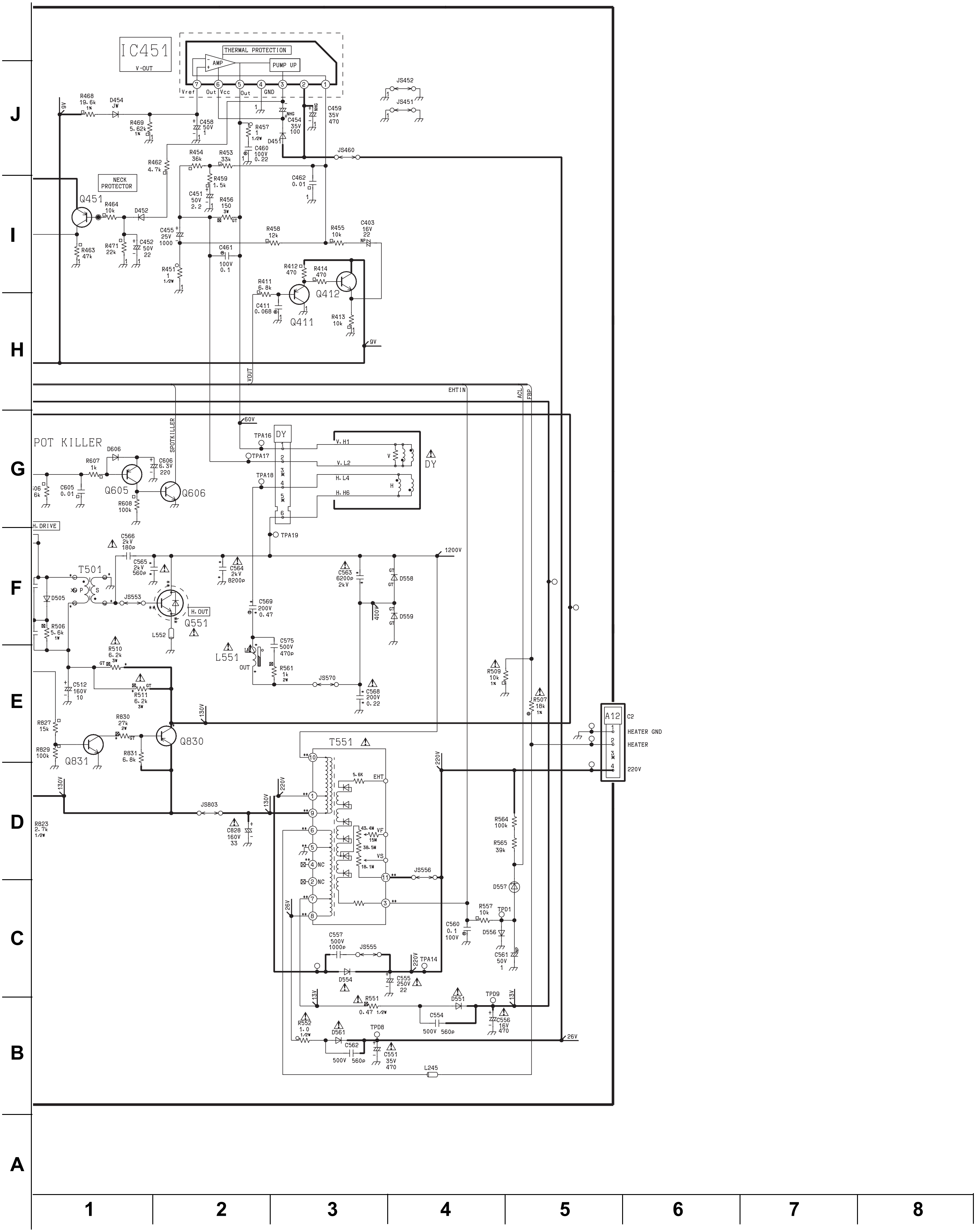


J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
IC001
AMCV8
COMB/SyncSepa/RGB/DEF/DET
Digital_1chip_on_farmware
IC002
16K
I²C
EEPROM
IC004
IC005
STANDBY 5V
STANDBY 3.3V
IC501
IC3001
VIDEO SW
(V1 for G model)
Q560
Q070
Q3001
Q3002
Q2350
T3001
T3002
X001
D007
D003
D001
D531
D3001
D3004
D3005
D3007
D3008
D3009
D3010
D3011
D3012
D3017
D3018
D3019
D3021
D3023
D3024
D2305
D2307
D2350
D2353
JS015
JS016
JS017
JS401
JS3000
JS2320
JS2323
TP017
TP412
TPA13
RMT1
S/B5V
S/B3.3V
3.3V
5V
13V
22V
BOUT
GOUT
ROUT
HOUT
FBP
EHTIN
ACL
SPOTKILLER
VOUT
SCL1
SDA1
SCL2
SDA2
DEG
POWER
KEY1
KEY2
AFC1
FA1
COMPONENT:OPEN
COMPOSIT:CLOSE
JK3001
REAR AV
JK3002
FRONT AV
SP1
L
R

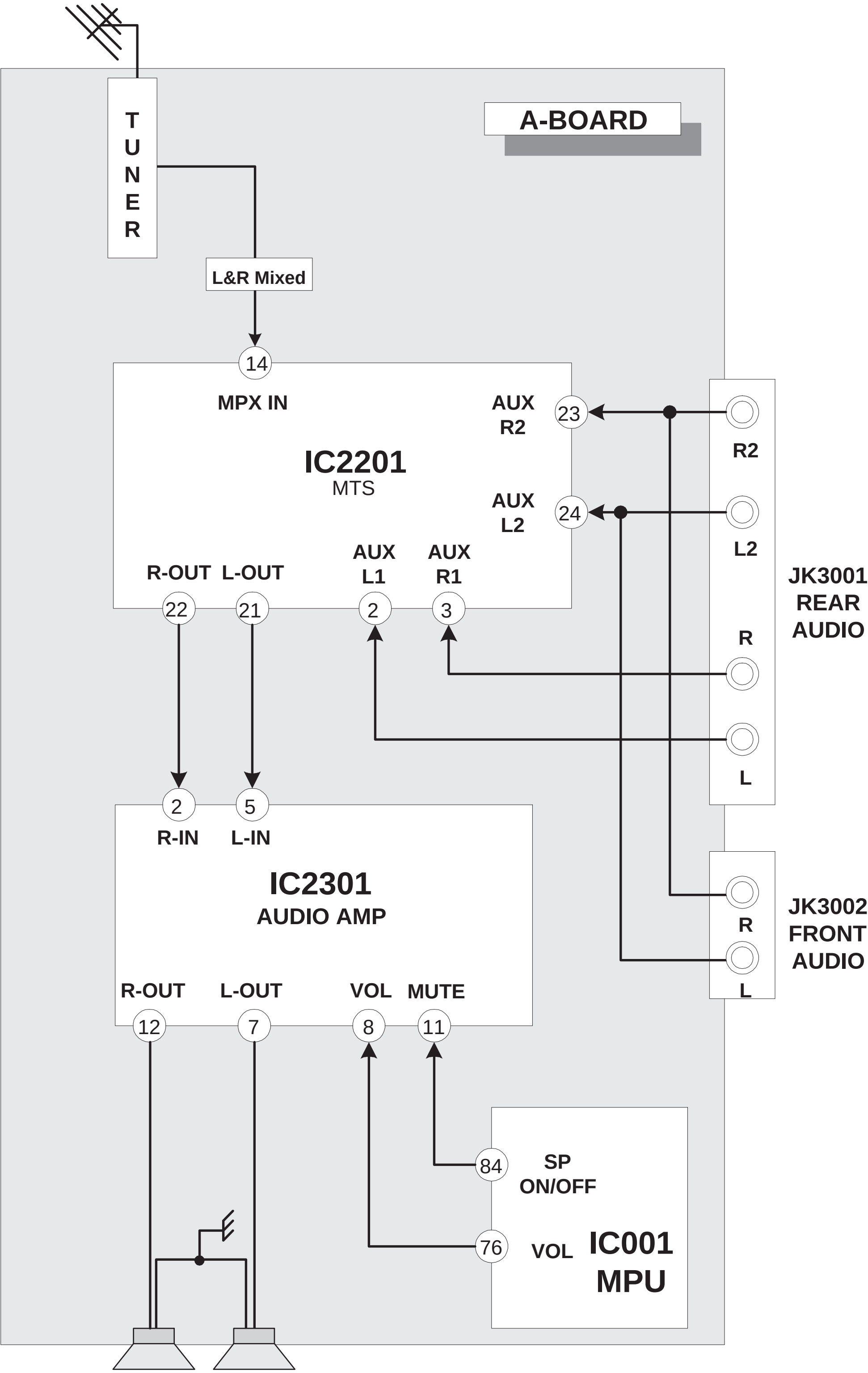


S/B3.3V
R026 560 1/2W
POWER
DEG
RMT
D016 10V 100
D010
IC003
VOUT
GND
VCC
CENTER PIN
R046 1k
JS003
JS001
KEY2
KEY1
D055
R039 1k
R032 10k
POWER
TPS7
R038 22k
TV/VID
ACTION
R037 9.1k
CH UP
R036 5.1k
CH DWN
R035 3.3k
VOL UP
R034 2.2k
VOL DWN
R033 2.2k
S009
S008
S005
S004
S003
S002
S001
L008 47
C032 10V 47
IC551
9V
C570 16V 220
C571 16V 22
R043 15k
R042 2.2k
IC552
5V
L108
13V
R562 27 2W
C572 6.3V 220
C573 16V 100
R093 330
R092 47k
Q092
9V
13V
R559 68k 2W
TUNER BT +30V
HOUT
SPOT K
22V
L2301 J42
AUDIO B+
L2303
R605 10k
C829 16V 470
L803 68
R504 1k
R606 5.6k
D2350
12V
COLD
HOT
C510 500V 10p
H.DRIVE
Q501
9V
AC120/220
DEG
C826 1kV 470p
12V
L808
D824
C827 16V 1000
C506 500V 1000p
D505
D806
D820
R828 100k
C505 0.1
R506 5.6k 1W
RL801
JS806
C821 0.01
D002
L810
C801 500V 4700p
D801
R801 1.5 7W
200V/400V
C822 1kV 220p
R004 5.6k
Q001
L809
22V
D822
C009 0.1
C803 500V 4700p
C802 500V 4700p
C805 200V 330
TPD15
R802 100k 2W
C806 400V 0.01
R850 0.22 1/2W
C823 35V 470
OCP
R804 220k 1W
JS2310
JS801
JS800
TPD16
400V/800V
130V
R827 15k
IC2301A 5Wx2
RF
GND IN
L-IN
VAO-L
L-OUT
VOL
POWER GND
VCC
STAND-BY MUTE
R-OUT
D808
C824 1kV 1000p
TPD14
130V
R829 100k
L806
T801
R821 1 1/2W
C800 1kV 1500p
NC
D
2313 25V 22
D2302
C2301 25V 1000
AC120/220
R805 0.15 2W
R806 1.5 1/2W
L807
D823
L802 47
R822 1 1/2W
R823 2.7k 1/2W
IC801
S
R807 680
R808 1.5 1/2W
TPD17
C825 160V 220
C820 16V 100
L801
C808 50V 47
DB11
D809
Q820
GND
JS812
C2308 0.01
C2304 16V 100
Vin
R809 4.7k
16V
R824 22k
OCP
D810
C809 1000p
12V
R825 2.7k
C812 AC250V 0.22
C810 470p
D821
JS2323
JS2324
JS2321
F801
F6.3A 125V/250V
STAND-BY PRC CIRCUIT
CRA801
D2355
R815 8.2M 1/2W
C813 AC250V 0.015
C814 AC250V 0.015
R810 220
D803
IC802
R832 1.2k
R833 47k
TPM2
TPM1
Q801
Q802
R834 4.7k
AC1
R837 10k
R838 10k
ACCORD
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8

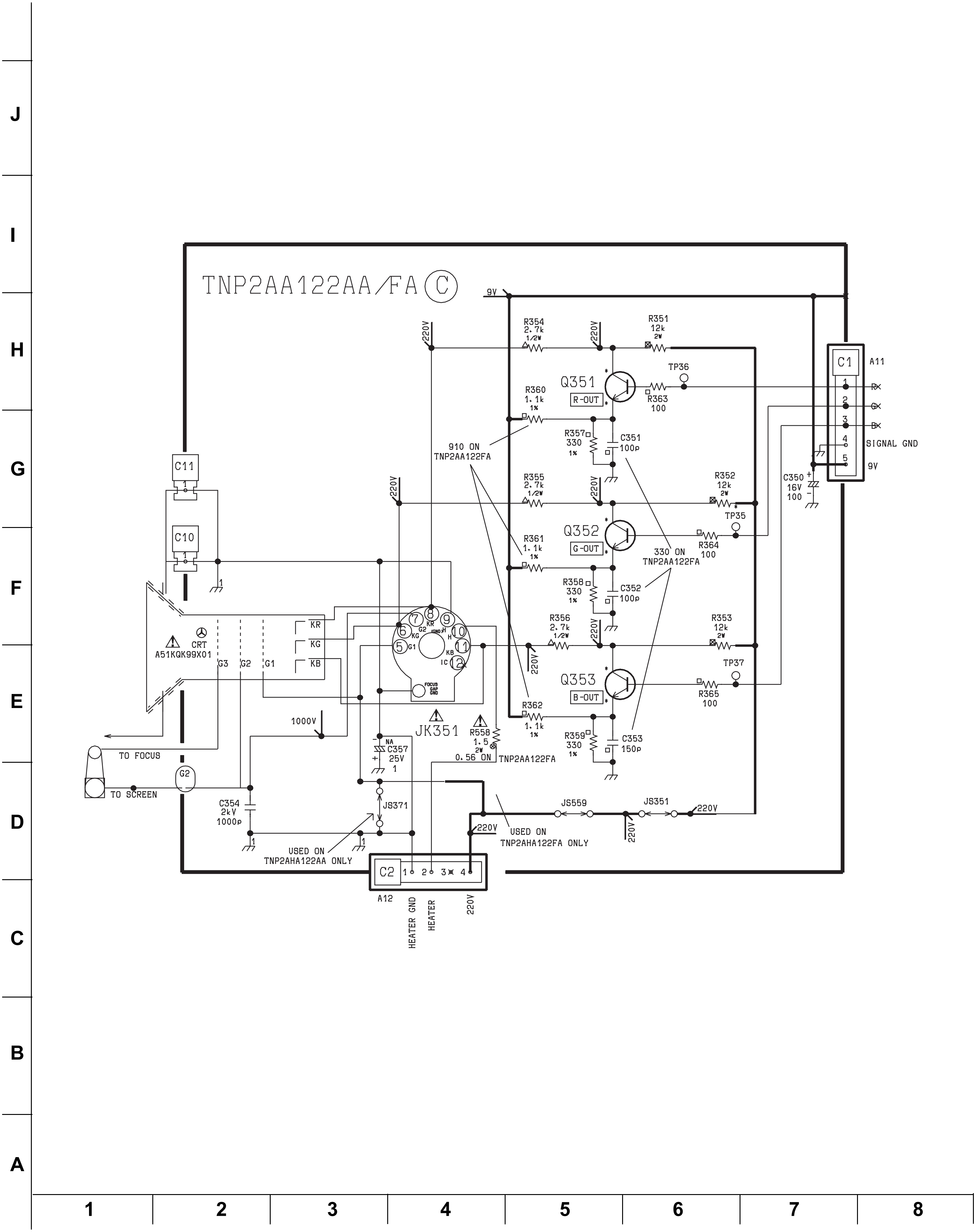
A-BOARD 3 of 4 TNP2AH047FA CT-25L8G / CT-25L8UG

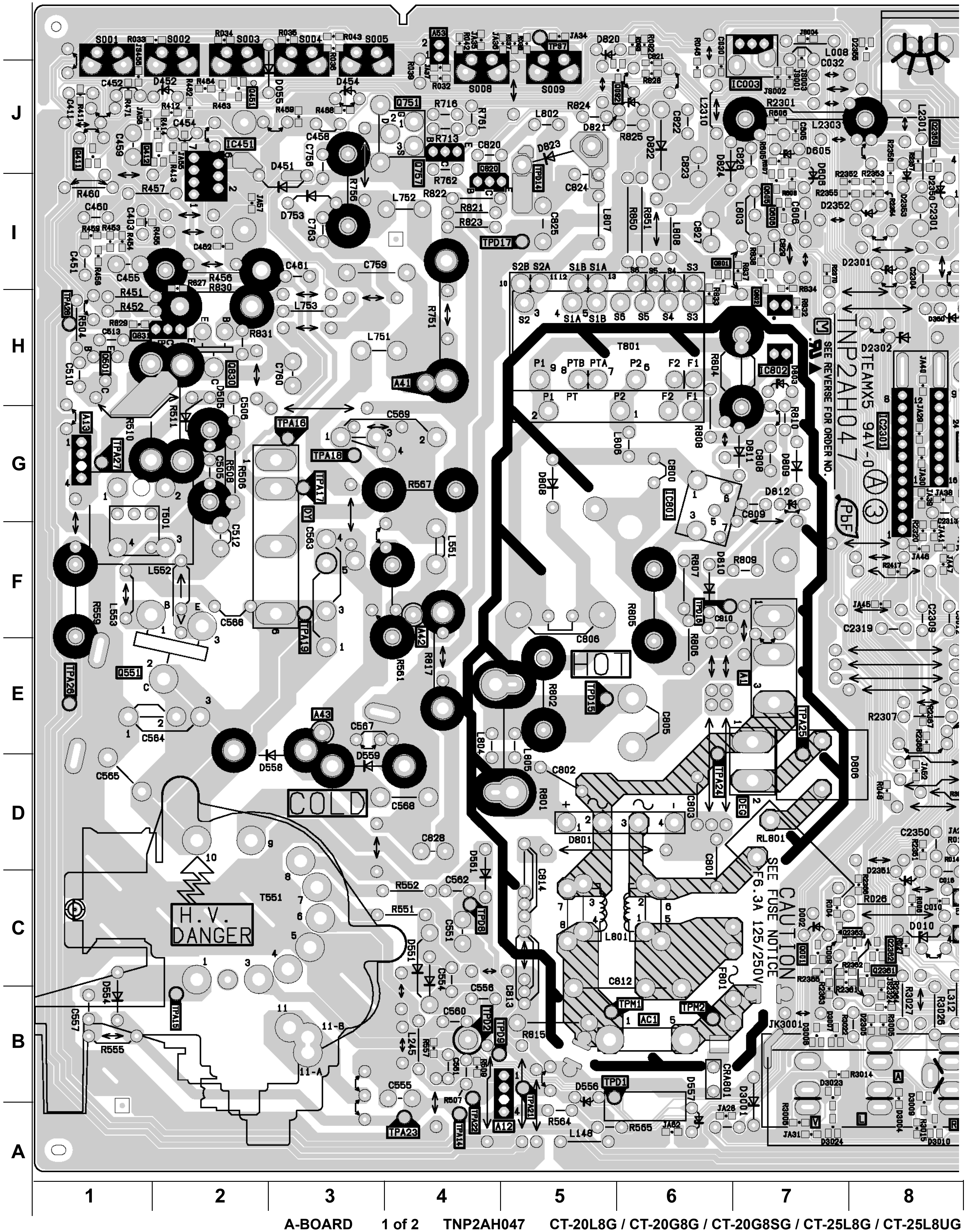

IC451
V-OUT
THERMAL PROTECTION
AMP
PUMP UP
Vref
Out
Vcc
Out
GND
R468 19.6k 1%
D454 JW
R469 5.62k 1%
C458 50V 1
R457 1 1/2W
C454 35V 100
C459 35V 470
D451
C460 100V 0.22
JS452
JS451
JS460
R462 4.7k
R454 36k
R453 33k
R459 1.5k
C462 0.01
NECK PROTECTOR
Q451
R464 10k
D452
C451 50V 2.2
R456 150 3W
C455 25V 1000
R458 12k
R455 10k
C403 16V 22
R463 47k
R471 22k
C452 50V 22
C461 100V 0.1
R451 1 1/2W
R412 470
R414 470
R411 6.8k
C411 0.068
Q411
Q412
R413 10k
9V
VOUT
EHTIN
ACL
FBP
60V
SPOT KILLER
SPOTKILLER
D606
R607 1k
C606 6.3V 220
Q605
Q606
C605 0.01
R608 100k
TPA16
TPA17
TPA18
TPA19
DY
V.H1
V.L2
H.L4
H.H6
H.DRIVE
C566 2kV 180p
T501
C565 2kV 560p
C564 2kV 8200p
C563 6200p 2kV
D558
D559
400V
1200V
D505
R506 5.6k 1W
JS553
Q551
H.OUT
L552
C569 200V 0.47
C575 500V 470p
L551
OUT
R561 1k 2W
JS570
C568 200V 0.22
R510 6.2k 3W
R511 6.2k 3W
C512 160V 10
R509 10k 1%
R507 18k 1%
130V
R827 15k
R829 100k
Q831
R830 27k 2W
R831 6.8k
Q830
A12
C2
HEATER GND
HEATER
220V
T551
EHT
VF
VS
5.6K
43.4M
15M
38.5M
18.1M
NC
NC
JS803
C828 160V 33
R823 2.7k 1/2W
R564 100k
R565 39k
D557
JS556
R557 10k
TPD1
D556
C560 0.1 100V
C561 50V 1
26V
C557 500V 1000p
JS555
D554
C555 250V 22
TPA14
13V
R551 0.47 1/2W
D551
C554 500V 560p
TPD9
C556 16V 470
R552 1.0 1/2W
D561
C562 500V 560p
TPD8
C551 35V 470
L245
26V
A
B
C
D
E
F
G
H
I
J
1
2
3
4
5
6
7
8

Audio signal path block diagram

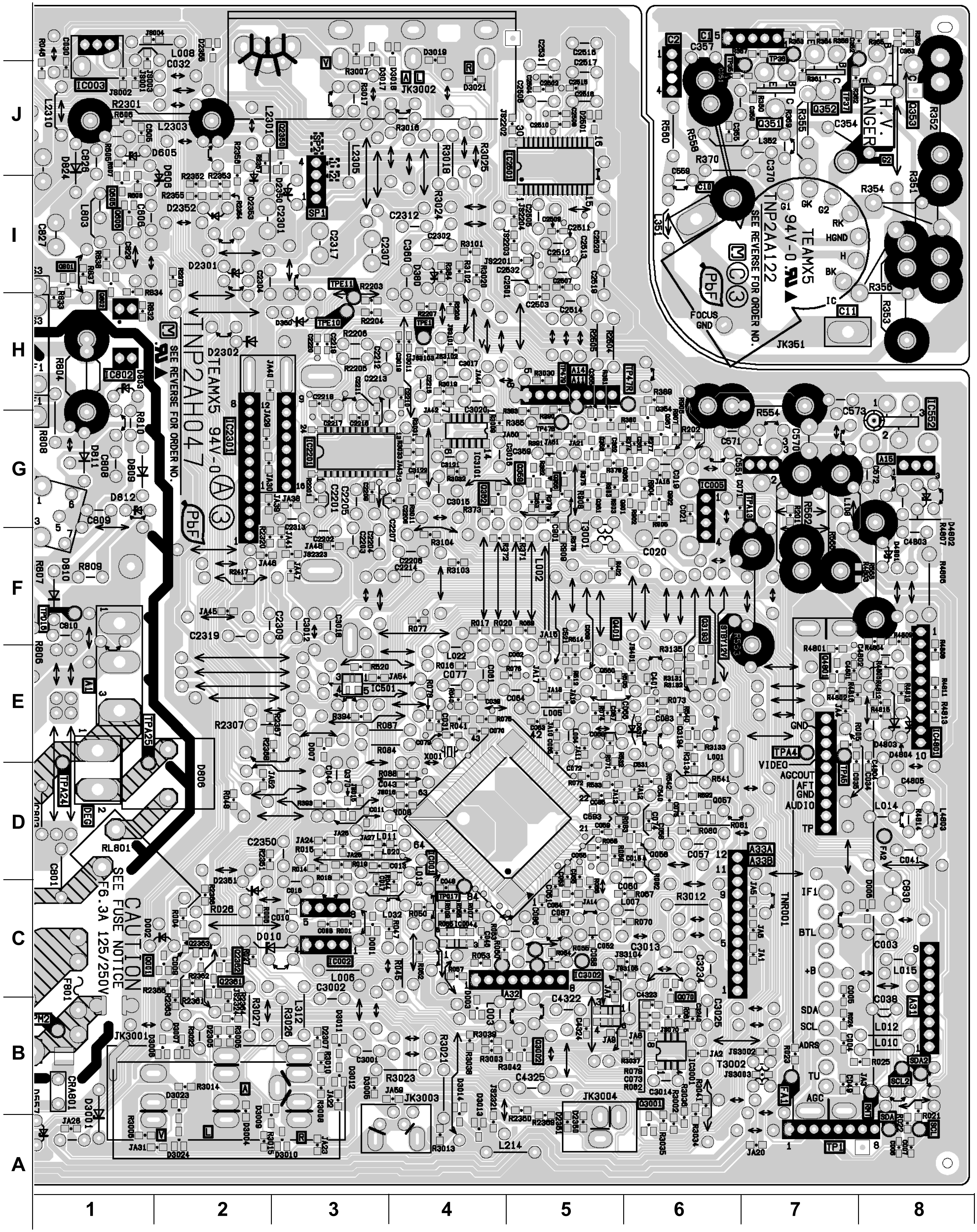

A-BOARD
TUNER
L&R Mixed
14
MPX IN
IC2201
MTS
AUX R2
23
AUX L2
24
R-OUT
L-OUT
22
21
AUX L1
2
AUX R1
3
R2
L2
R
L
JK3001 REAR AUDIO
JK3002 FRONT AUDIO
R
L
2
5
R-IN
L-IN
IC2301
AUDIO AMP
R-OUT
L-OUT
VOL
MUTE
12
7
8
11
84
SP ON/OFF
76
VOL
IC001
MPU

CT-20L8G / CT-20G8G / CT-20G8SG / CT-25L8G / CT-25L8UG


TNP2AA122AA/FA Ⓒ
9V
R354
2.7k
1/2W
220V
R351
12k
2W
C1
A11
Q351
R-OUT
TP36
R363
100
R360
1.1k
1%
R357
330
1%
C351
100p
910 ON
TNP2AA122FA
R355
2.7k
1/2W
R352
12k
2W
TP35
C350
16V
100
Q352
G-OUT
R364
100
R361
1.1k
1%
330 ON
TNP2AA122FA
R358
330
1%
C352
100p
R356
2.7k
1/2W
R353
12k
2W
TP37
Q353
B-OUT
R365
100
R362
1.1k
1%
R359
330
1%
C353
150p
1 R
2 G
3 B
4
5
SIGNAL GND
9V
C11
C10
CRT
A51KQK99X01
G3
G2
G1
KR
KG
KB
7 8 9 KR G2 (GND) H
6 KG
5 G1
10
11
12 IC KB
FOCUS GAP GND
JK351
1000V
R558
1.5
2W
0.56 ON TNP2AA122FA
NA
C357
25V
1
TO FOCUS
TO SCREEN
G2
C354
2kV
1000p
JS371
USED ON
TNP2AHA122AA ONLY
JS559
JS351
USED ON
TNP2AHA122FA ONLY
C2
1 2 3 4
A12
HEATER GND
HEATER
220V
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8

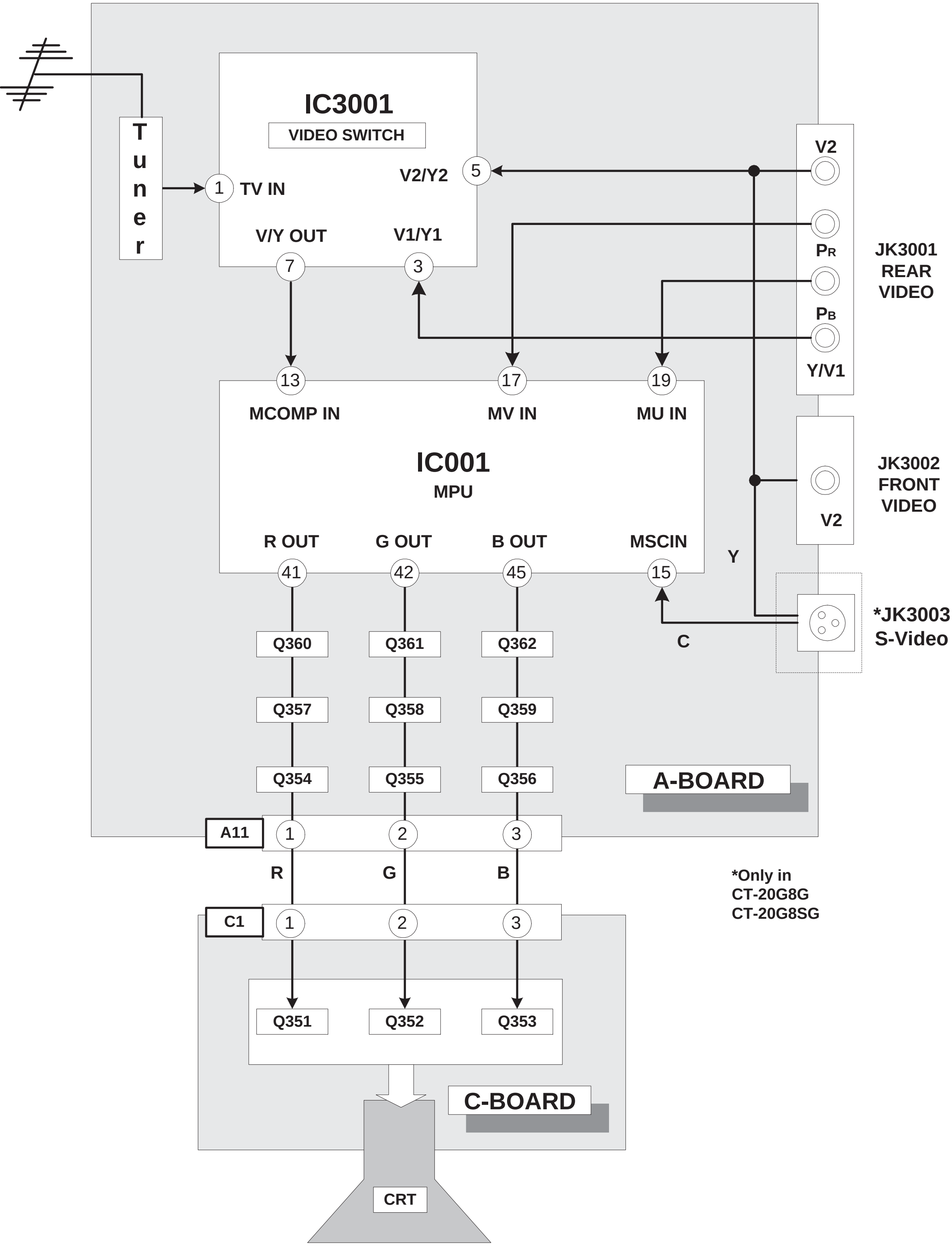

J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
S001
S002
S003
S004
S005
S008
S009
IC451
IC003
IC801
IC802
IC2301
T801
T501
T551
Q751
Q551
Q830
Q831
Q501
L2303
L2301
L801
L751
L753
L551
L552
L553
D451
D558
D559
D801
D806
R567
R561
R559
R802
R801
R805
RL801
F801
AC1
JK3001
CRA601
TPA16
TPA17
TPA18
TPA19
TPA23
TPA24
TPA25
TPA26
TPA27
TPD1
TPD15
TPD17
TPM1
TPM2
A11
A12
A13
A41
A42
A43
DY
DEG
TNP2AH047
TEAMX5 94V-0
SEE REVERSE FOR ORDER NO.
PbF
HOT
COLD
H.V. DANGER
CAUTION
SEE FUSE NOTICE
F6.3A 125/250V

A-BOARD 1 of 2 TNP2AH047 CT-20L8G / CT-20G8G / CT-20G8SG / CT-25L8G / CT-25L8UG


J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
TNP2AH047
94V-0
SEE REVERSE FOR ORDER NO.
TNP2AA122
SEE REVERSE FOR ORDER NO.
H.V. DANGER
CAUTION
SEE FUSE NOTICE
F6.3A 125/250V
JK351
FOCUS
GND
VIDEO
AGCOUT
AFT
GND
AUDIO
TP
IF1
BTL
+B
SDA
SCL
ADRS
TU
AGC
IC2301
IC2201
IC3101
IC501
IC001
IC002
IC3002
IC005
IC4801
IC552
IC803
IC802
JK3001
JK3002
JK3003
JK3004
TNR001
D806
RL801
F801

A-BOARD 2 of 2 TNP2AH047 C-BOARD TNP2AA122 CT-20L8G / CT-20G8G / CT-20G8SG / CT-25L8G / CT-25L8UG

Video signal path block diagram



Tuner
IC3001
VIDEO SWITCH
1 TV IN
V2/Y2 5
V/Y OUT 7
V1/Y1 3
V2
PR
PB
Y/V1
JK3001
REAR
VIDEO
JK3002
FRONT
VIDEO
V2
Y
*JK3003
S-Video
C
13 MCOMP IN
17 MV IN
19 MU IN
IC001
MPU
R OUT 41
G OUT 42
B OUT 45
MSCIN 15
Q360
Q361
Q362
Q357
Q358
Q359
Q354
Q355
Q356
A-BOARD
A11
1
2
3
R
G
B
C1
1
2
3
Q351
Q352
Q353
C-BOARD
CRT

*Only in
CT-20G8G
CT-20G8SG

CT-20L8G / CT-20G8G / CT-20G8SG / CT-25L8G / CT-25L8UG

A - BOARD

IC001

1	0.00	43	2.50
2	0.00	44	1.70
3	0.00	45	0.00
4	0.00	46	0.00
5	0.00	47	3.30
6	1.20	48	1.90
7	1.20	49	1.90
8	1.30	50	1.60
9	3.30	51	1.70
10	0.00	52	3.30
11	2.70	53	1.70
12	1.50	54	1.40
13	1.40	55	3.30
14	0.40	56	1.40
15	1.60	57	0.00
16	2.20	58	0.00
17	0.07	59	3.30
18	1.70	60	3.30
19	0.00	61	3.30
20	1.40	62	0.70
21	1.00	63	3.30
22	2.60	64	3.30
23	0.00	65	3.40
24	1.90	66	3.50
25	1.90	67	0.10
26	1.40	68	3.20
27	0.00	69	0.00
28	0.00	70	0.00
29	1.30	71	0.00
30	1.80	72	5.20
31	1.00	73	5.20
32	3.30	74	0.00
33	1.70	75	0.00
34	0.80	76	0.00
35	0.00	77	3.30
36	0.60	78	0.00
37	3.30	79	0.00
38	3.30	80	3.30
39	2.30	81	5.20
40	1.70	82	3.30
41	0.40	83	0.00
42	0.40	84	3.30

IC002

1	0.00
2	0.00
3	0.00
4	0.00
5	3.40
6	3.40
7	5.20
8	5.20

IC003

1	0.00
2	3.31
3	3.27

IC004

1	0.00
2	0.00
3	0.00
4	3.30
5	3.30

IC005

1	9.10
2	3.30
3	0.00
4	9.10

IC451

1	2.00
2	23.30
3	1.20
4	0.00
5	11.60
6	23.50
7	2.00

IC501

1	0.00
2	1.35
3	0.00
4	1.05
5	3.30

IC551

1	12.20
2	0.00
3	9.00

IC552

1	7.50
2	0.00
3	5.00

IC801↓

1	-21.00
2	N/A
3	0.10
4	N/A
5	0.00
6	32.24
7	1.50

IC802↓

1	2.30
2	32.24

IC2201

1	1.60	13	2.80
2	2.20	14	2.20
3	2.20	15	2.50
4	2.30	16	3.50
5	2.40	17	0.00
6	0.07	18	3.20
7	5.00	19	3.40
8	2.50	20	0.00
9	2.60	21	2.20
10	0.80	22	2.20
11	2.30	23	2.20
12	2.50	24	2.20

IC2301

1	6.40
2	5.60
3	16.80
4	0.00
5	5.60
6	6.30
7	8.60
8	0.00
9	0.00
10	18.30
11	3.10
12	8.70

IC3001

1	4.10
2	0.20
3	4.10
4	0.00
5	4.10
6	9.00
7	4.30
8	0.00

A - BOARD

	Q001	Q057	Q058	Q070	Q092	Q2350	Q3001	Q3002	Q354
B	0.00	1.50	1.50	4.12	8.90	5.35	1.30	1.30	4.50
C	13.00	0.00	0.00	8.90	1.40	0.00	3.30	3.30	8.50
E	0.00	0.07	0.07	3.50	3.30	3.14	0.70	0.70	3.80

	Q355	Q356	Q357	Q358	Q359	Q360	Q361	Q362	Q411
B	4.30	4.40	2.60	2.60	2.60	0.50	0.40	0.40	2.25
C	8.40	8.40	4.50	4.30	4.40	0.00	0.00	0.00	0.00
E	3.60	3.70	2.00	2.00	2.00	1.10	1.10	1.10	2.90

	Q412	Q451	Q501	Q551	Q560	Q605	Q606	Q801	Q802
B	2.90	5.10	0.40	0.00	0.30	4.80	0.00	0.00	0.70
C	9.00	1.40	56.80	14.70	0.00	0.00	3.30	12.52	0.00
E	2.40	3.30	0.00	0.00	0.60	4.70	0.00	0.00	0.00

	Q820	Q830	Q831
B	130.40	129.80	0.60
C	0.00	130.40	0.20
E	130.80	130.50	0.00

C - BOARD

	Q351	Q352	Q353
B	130.40	129.80	0.60
C	0.00	130.40	0.20
E	130.80	130.50	0.00